Nuclear Operating Company

South Texas Project Electric Generating Station 4000 Avenue F – Suite A Bay City, Texas 77414

July 15, 2008
ABR-AE-08000052

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
One White Flint North
11555 Rockville Pike
Rockville MD 20852-2738

South Texas Project
Units 3 and 4
Docket Nos. 52-012 and 52-013
Response to Requests for Additional Information

References:

1. Letter, Paul Kallan to Greg Gibson, "Request for Additional Information, Letter Number One Related to the Environmental Report for the South Texas Combined License Application", dated May 19, 2008 (AE-ABR-08000097)

2. Letter, Greg Gibson to Document Control Desk, "Response to Requests for Additional Information", dated July 2, 2008 (ABR-AE-08000048)

Attached are 64 responses to NRC questions included in Reference 1. Seventeen of these responses are for the 60-day response group and are listed below by Question Number:

02.04.02-02	05.08-01
02.05-02	05.08-02
02.05-15	05.08-04
02.05-29	06.03-02
04.02-12	09.03.01
04.04-10	09.03-02
04.04-11	09.03-03
04.04-13	09.03-04
05.03.04-02	

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Also, 47 RAI responses from the 75-day response group, as identified in Reference 2, were completed and are listed below by Question Number:

02.03-11	02.07-04	04.03.01-01	05.02-03
02.03-12	02.07-05	04.03.02-01	05.03.01.02-01
02.03-15	04.02-01	04.04-06	05.03.01.02-02
02.05-07	04.02-02	04.04-07	05.03.02-02
02.05-18	04.02-03	04.04-08	05.08-03
02.05-21	04.02-04	04.04-09	06.03-01
02.05-22	04.02-05	04.04-15	07.01-01
02.05-23	04.02-07	04.04-16	07.01-02
02.05-24	04.02-08	04.04-17	09.03.02-02
02.07-01	04.02-09	04.06-02	09.03.02-03
02.07-02	04.02-10	05.02-01	09.04-01
02.07-03	04.02-11	05.02-02	

When a change to the COLA is indicated by a question response, the change will be incorporated into the next routine revision of the COLA following NRC acceptance of the question response.

There are no new commitments made in this letter.

If you have any questions, please feel free to contact me at (361) 972-4626, or Russell W. Kiesling at (361)-972-4716

I declare under penalty of perjury that the foregoing is true and correct.

Executed on July 15, 2008

Greg Gibson
Manager, Regulatory Affairs
South Texas Project, Units 3 & 4

rwk

Enclosure:
CD - RAI Supporting Files

Attachments:

1. Question 02.03-11
2. Question 02.03-12
3. Question 02.03-15
4. Question 02.04.02-02
5. Question 02.05-02
6. Question 02.05-07
7. Question 02.05-15
8. Question 02.05-18
9. Question 02.05-21
10. Question 02.05-22
11. Question 02.05-23
12. Question 02.05-24
13. Question 02.05-29
14. Question 02.07-01
15. Question 02.07-02
16. Question 02.07-03
17. Question 02.07-04
18. Question 02.07-05
19. Question 04.02-01
20. Question 04.02-02
21. Question 04.02-03
22. Question 04.02-04
23. Question 04.02-05
24. Question 04.02-07
25. Question 04.02-08
26. Question 04.02-09
27. Question 04.02-10
28. Question 04.02-11
29. Question 04.02-12
30. Question 04.03.01-01
31. Question 04.03.02-01
32. Question 04.04-06
33. Question 04.04-07
34. Question 04.04-08
35. Question 04.04-09
36. Question 04.04-10
37. Question 04.04-11
38. Question 04.04-13
39. Question 04.04-15
40. Question 04.04-16
41. Question 04.04-17
42. Question 04.06-02
43. Question 05.02-01
44. Question 05.02-02
45. Question 05.02-03
46. Question 05.03.01.02-01
47. Question 05.03.01.02-02
48. Question 05.03.02-02
49. Question 05.03.04-02
50. Question 05.08-01
51. Question 05.08-02
52. Question 05.08-03
53. Question 05.08-04
54 Question 06.03-01
55. Question 06.03-02
56. Question 07.01-01
57. Question 07.01-02
58. Question 09.03.02-02
59. Question 09.03.02-03
60. Question 09.03-01
61. Question 09.03-02
62. Question 09.03-03
63. Question 09.03-04
64. Question 09.04-01

cc: w/o attachment except*
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Question 2.3-11

QUESTION:

Address the inconsistency between the 1985 forecast of a decline in groundwater use in Matagorda County against currently available county data on groundwater use.

Provide a projection of future groundwater use in Section 2.3.2.2, and provide a breakdown of water demand, described in Table 2.3.2-6, between that to be provided by surface water and groundwater resources.

Full Text (Supporting Information):

(1) Provide a summary discussion of the underlying rationale for the substantial decline in groundwater consumption in Matagorda County (~50%) by 2030 forecasted by the State of Texas in 1985 (e.g., movement from groundwater to surface water sources because of salt or brackish water intrusion, an observed and marked decline in groundwater quality). Has salt or brackish water intrusion been observed, evaluated, or forecasted for the Chicot aquifer? Since the 1985 forecast, how has groundwater resource utilization changed? Has the forecast become reality? Based on the NRC's initial independent evaluation, in discussions with the Coastal Plain Groundwater Conservation District (CPGWCD) during the ER Site Audit in February 2008, the 1985 forecast does not appear to have materialized and that portraying groundwater usage in Matagorda County in this light may not be current despite the availability of a State authored reference. Provide a discussion to reconcile these views.

(2) Provide a projection of future groundwater use in Section 2.3.2.2 that could affect or be affected by the construction or operation of the proposed project. The current discussion is limited to current or present-day usage. Table 2.3.2-6 provides the water demand for the Lower Colorado River Region; however, it appears to represent the combined surface water and groundwater demand. If the table reflects the combined demand, then provide a breakdown of the water demand described in Table 2.3.2-6 between surface water and groundwater resources.

RESPONSE:

Question (1):
In the Environmental Report (ER) and the Final Safety Analysis Report (FSAR), the Ground Water Atlas of the United States - Oklahoma, Texas (USGS, 1996) was referenced to cite the Texas Department of Water Resources (TDWR) forecast for a 48 percent decline in groundwater consumption in Matagorda County by 2030. Because the state report is an unavailable limited publication (LP-201), details on how the state anticipated making up for the decline in groundwater use (e.g., conservation, surface water use, and/or brackish water use) could not be determined when the ER and FSAR were prepared. The U.S. Geological Survey (USGS) stated that based on oral and written communication with the Texas Water Development Board (TWDB) the forecasted groundwater withdrawal decreases for coastal counties like Matagorda

County were attributed to the state's concerns regarding potential saltwater intrusion and land subsidence (USGS, 1996). Therefore, other available information regarding saltwater encroachment or upward movement of brackish groundwater and land-surface subsidence was reviewed to address these issues as viable concerns at STP.

Saltwater Intrusion

Saltwater intrusion is a concern in the larger coastal cities in Texas, such as those in the Houston-Galveston area. According to the Groundwater for Agriculture Team (LSWP, 2007), groundwater depths to the 3,000 ppm total dissolved solid (TDS) surface in the vicinity of the STP plant are estimated to be in the range of 800 to 1,000 feet. Based on driller's records, each of the STP Deep Aquifer production wells are screened at various intervals between 292 feet and 702 feet in depth, and can yield between 200 and 600 gallons per minute (gpm) as summarized in FSAR Tables 2.4S.12-2 and -3.

Groundwater quality data collected by STP from 1975 through 1991 from four of the five Deep Aquifer production wells (Table 2.3.1-20) indicate TDS concentrations range from 256 milligram per liter (mg/L) at production well No. 8 (1991) to 648 mg/L at production well No. 5 (1982). Specific conductance at these two wells was recorded as high as 863 micromhos per centimeter (umhos/cm) in 1975 (No. 5). Chlorides ranged from 33 mg/L (No. 8) to 87 mg/L (No. 5), sodium from 71 mg/L (No. 8) to 177 mg/L (No. 5), and potassium from 1.4 mg/L (No. 7) to 1.3 mg/L (No.5). Production well No. 5 was sampled for each of these salt water indicators in 1975 and 1982. Comparison of these data over this seven year period does not indicate an increasing trend for these parameters.

Land-Surface Subsidence

The extent of actual land-surface subsidence in Matagorda County by 1970 was between 0.2 feet and one foot in the northeast portion of the County, and 2.5- to 5-feet in a localized depression in the vicinity of Bay City (TDWR, 1979). Maps presented in TDWR, 1979 do not indicate land subsidence at STP. The TDWR study used a digital numerical model to predict drawdown and subsidence from 1970 to 2020. Based on the results of this model, land subsidence is not predicted at STP through 2020, and no more than one-foot of subsidence is predicted for the northern portion of Matagorda County (TDWR, 1979).

Based on data from 1918 to 1973, the USGS (1980) indicates measured land surface subsidence was not present in the immediate vicinity of STP and the nearest area of land surface subsidence (0.5 foot contour) is located about five miles west of STP near the Pheasant Oil and Gas Field. The USGS (1980) indicates maximum land surface subsidence in Matagorda County to be 1.98 feet in the vicinity of the Francitas North Oil Field located 10 miles west of STP. Although this study indicates groundwater withdrawal as the principal cause of subsidence in Matagorda County, it is evident that land surface subsidence may be largely attributed to oil and gas withdrawals considering the density of oil fields compared to water well fields at and within the 0.5 foot contour.

The USGS prepared a Groundwater Availability Model (GAM) in 2005 to project water levels and land-surface subsidence to 2050 for the North Gulf Coast aquifer system (USGS, 2005).

This GAM includes all of Matagorda County. Based on this GAM, land subsidence at or exceeding one foot is not predicted in Matagorda County to 2050.

Groundwater Forecasts

The Coastal Plain Groundwater Conservation District (CPGCD) Groundwater Management Plan approved by TWDB on October 10, 2004, states that the Regional Water Planning Group (Region K) estimates that 49,221 acre-feet per year (AF/Y) of usable groundwater is available from the Gulf Coast aquifer in Matagorda County (Turner Collie & Braden, Inc., 2004). Between 1980 and 2000, the average groundwater withdrawal in Matagorda County from the Gulf Coast aquifer was 30,233 AF/Y (Turner Collie & Braden, Inc., 2004). Groundwater supply in Matagorda County by 2050 is projected to be 35,785 AF/Y and is less than the groundwater availability estimate of 49,221 AF/Y (Turner Collie & Braden, Inc., 2004). However, the CPGCD states that little science was utilized in the development of this number and suggests it be used with caution (Turner Collie & Braden, Inc., 2004). It should be noted that groundwater availability estimates and supply projections are periodically revised by these agencies.

Further complicating the situation, the TWDB-approved water demand projections are not presented with separate surface water and groundwater figures as some water regions merge the two together to manage their water resources. Using Region K estimates, CPGCD predicts combined surface and groundwater demand estimates for Matagorda County will exceed projected supplies in the future. Water conservation strategies and desalination of sea water and deeper brackish groundwater have been proposed to help meet the projected demand.

Like many aspects of Texas water regulations, water use projections can be confusing, mostly due to the conflicting information and methodologies used by the different agencies involved and the lack of "separation" of surface and groundwater use in these projections. To help remedy this, historic groundwater use estimates were obtained from TWDB and USGS Internet websites to obtain the percentage of groundwater use in the county by user groups (e.g., irrigation, industry, municipal, mining, livestock, and power generation). As shown in Figure 1, the USGS data (USGS *Estimated Use of Water in the United States* Internet Weblink) exhibit an overall downward trend from 1985 at 35,589 AF/Y to 2000 at 15,614 AF/Y with a fair reliability of correlation of $R^2 = 0.72$. The TWDB data (TWDB *County Water Demand Projections* Internet Weblink) exhibit more variability, largely due to irrigation, and as a result the TWDB data have no correlation to the generated trend line. This may be in part attributable to the USGS database being collected every five years and the TWDB data being collected approximately annually. Neither database has 2005 or later data available as of May 13, 2008.

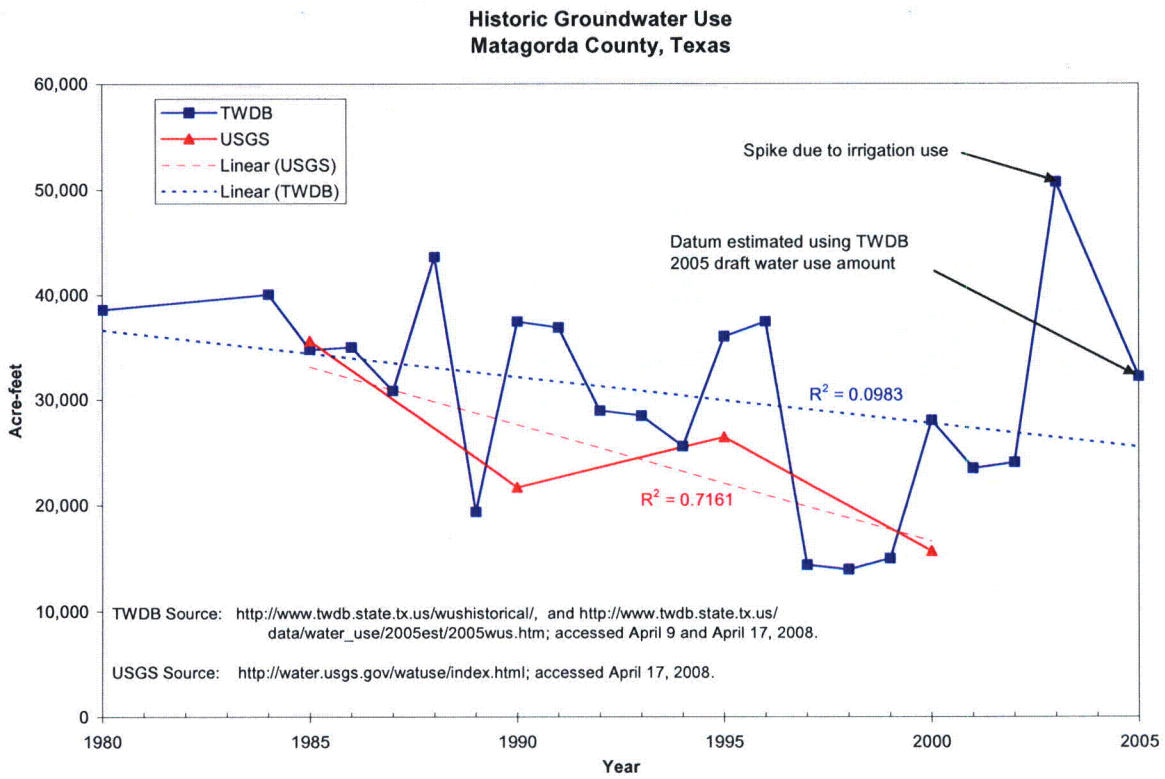

Figure 1- Comparison of TWDB and USGS reported total groundwater withdrawals for Matagorda County from 1980 through 2005.

Because separate groundwater demand projections for Matagorda County are not available, groundwater utilization for Matagorda County was estimated in the FSAR using projected water use from the Lower Colorado Regional Water Planning Group (LCRWPG) Water Plan and historic uses from the TWDB. To provide further insight to how the groundwater utilization may have changed since the forecast presented by TDWR in 1985, the data collected by the USGS regarding historic groundwater use in Matagorda County were also used to provide a "separation" of groundwater from the TWDB-approved water demand projection data.

Based on the individual water use group projections detailed in FSAR Section 2.4S.12.2.1, summarized in Table 2.4S.12-6 and illustrated in Figure 2.4S.12-14, a groundwater use projection for Matagorda County for 2060 is estimated to be about 42,000 acre-feet. Using the USGS historic groundwater use data, a similar projection is estimated to be about 32,500 acre-feet. The contrast illustrates the problem of dealing with the combined projected water uses provided by the TWDB. However, both of these estimates are below the estimated groundwater availability amount of 49,221 acre-feet for Matagorda County (Turner Collie & Braden, Inc., 2004).

There were noted inconsistencies in estimating and defining groundwater availability by TWDB and the various Regional Water Planning Groups (RWPGs) (Mace and others, 2001). The TWDB has stated "Like beauty, availability (of groundwater) is in the eye of the beholder", and due to the confusion and problems associated with estimating groundwater availability in Texas,

some RWPGs recommend that TWDB develop a standard for assessing groundwater availability (Mace and others, 2001). As the LCRWPG and TWDB continue to revise their projections of available groundwater use for Matagorda County, the CPGCD available groundwater use estimates are likely to change.

REFERENCES:

1) LSWP (Lower Colorado River Authority and San Antonio Water System Water Project) Groundwater for Agriculture Team, 2007. *Final Incorporation of Subsidence Modules into the Interim LSWP Model*, URS Corporation.

2) Mace, Robert E, William F. Mullican, III, and Ted Way, 2001, *Estimating Groundwater Availability in Texas*; Texas Water Development Board, Austin, Texas, 15 p.

3) TDWR, 1979, *Groundwater Availability in Texas – Estimates and Projections through 2030*; Report 238, Austin, TX, 77p.

4) TDWR, 1985, *Water use, projected water requirements, and related data and information for the metropolitan statistical areas in Texas*: Texas Department of Water Resources Publication LP-201, 226 p.

5) Turner Collie & Braden, Inc., May 2004, *Groundwater Management Plan, prepared for: Coastal Plains Groundwater Conservation District*, 20 p. http://www.twdb.state.tx.us/gwrd/GCD/plans/Coastal_Plains_GCD_Management_Plan_2004.pdf

6) TWDB Internet Weblink, *Historical Water Use Information*, http://www.twdb.state.tx.us/wushistorical/; accessed April 18, 2008.

7) TWDB Internet Weblink, *County Water Demand Projections*, http://www.twdb.state.tx.us/data/popwaterdemand/2003Projections/DemandProjections/County/county_demand_totals.htm; accessed April 18, 2008.

8) USGS, 1996, Ground Water Atlas Of The United States, Oklahoma, Texas; HA 730-E. http://capp.water.usgs.gov/gwa/ch_e/index.html

9) USGS, 1980, *Land-surface subsidence in the Texas coastal region*: USGS Open-File Report 80-969, 16 p.

10) USGS, 2005, *Evaluation of Ground-Water Flow and Land-Surface Subsidence Caused by Hypothetical Withdrawals in the Northern Part of the Gulf Coast Aquifer System, Texas*; Scientific Investigations Report 2005–5024, U.S. Department of the Interior, U.S. Geological Survey Reston, Virginia, 71p.

11) USGS, 2005b, *Bibliography of Ground-Water References for All 254 Counties in Texas, 1886-2001*; Open-File Report 2005-1270, U.S. Department of the Interior U.S. Geological Survey, Reston, Virginia, 321p.

12) USGS Internet Weblink, *Estimated Use of Water in the United States*, http://water.usgs.gov/watuse/data/2000/index.html; accessed April 18, 2008.

CANDIDATE COLA REVISION (Question 1):

To provide clarification to the discussion of groundwater use presented in this response and groundwater availability presented in response to RAI ER 2.3-12, the following revision to the third paragraph and the addition of a subsequent paragraph of ER Section 2.3.1.2.4.3 will be made:

> Groundwater is projected to be the main source of makeup water for the STP 3 & 4 UHS, condensate makeup, radwaste and fire protection systems and the source of potable water for STP 3 & 4. These systems are predicted to require typical groundwater consumption of approximately 1738 acre-ft per year (1077gpm), whereas the peak consumption (i.e., outages) is expected to be as great as 3935 gpm. Short term water demand beyond the current capacity of the existing wells could be met by increasing the yield of the existing wells, installing new wells with the objective of increasing peak production while not exceeding the 3000 acre-ft per year permitted amount, or withdrawing the necessary additional water from the MCR. (Water from the MCR will only be used for makeup to the UHS cooling towers.) ~~A detailed evaluation of groundwater availability and estimates of aquifer drawdown, water conservation measures, and identification of alternative sources, if practicably, will be addressed as part of the detailed engineering for STP 3 & 4.~~
>
> The Texas Water Development Board (TWDB) has proposed to use consensus yield, which considers science, policy, socio-economics, and stakeholder involvement, over safe or optimal yield when estimating groundwater availability (Reference 2.3.1-XX). The TWDB also urges planning groups to use Groundwater Availability Models (GAMs) to estimate groundwater availability of aquifers (Reference 2.3.1-XX+1). Estimates of groundwater availability are planning tools, not pumping limits (Reference 2.3.1-XX). Ultimately, however, groundwater in Texas is governed by the locally governed Groundwater Conservation District (GCD) where they exist and rules of capture (landowner right to capture the water beneath their property) where GCDs do not exist.
>
> The concept of the sustainable groundwater resource (e.g., safe yield or available groundwater resource) for STP may be obtained from the CPGCD Groundwater Management Plan approved by TWDB on October 10, 2004 or from one of the GAMs that covers Matagorda County. The CPGCD Groundwater Management Plan states (Reference 2.3.1-XX+2):

- The Regional Water Planning Group (Region K) estimates 49,221 acre-feet per year (AF/Y) of usable groundwater is available from the Gulf Coast aquifer in Matagorda County.
- The average total groundwater withdrawn between 1980 and 2000 in Matagorda County from the Gulf Coast aquifer was 30,233 AF/Y.
- The groundwater supply in Matagorda County is projected to be 35,785 AF/Y in 2050.

Further complicating the situation, the TWDB-approved total water demand projections are not presented with separate surface water and groundwater amounts. Using Region K estimates, CPGCD projects surface water and groundwater demand for Matagorda County will exceed projected supplies in the future. Water conservation strategies and desalination of deeper brackish groundwater have been proposed by Region K and the CPGCD to help met the projected demand.

Results of the North Gulf Coast Aquifer GAM, which consists of the finite-difference computer code MODFLOW96, indicate water level elevations in the Chicot aquifer at STP are simulated to be slightly less than sea level in 2000, and using the TWDB water demand projections, decline to an elevation of -50 feet between 2010 and 2050 (Reference 2.3.1-XX+3). This is in agreement with water levels observed in STP Deep Aquifer piezometers during 2005 and 2006 illustrated in Figure 2.3.1-24 and discussed in Section 2.3.1.2.3.4.

A second MODFLOW-based GAM, prepared for the Central Gulf Coast Aquifer by the TWDB, was rerun as GAM Run 07-36 in January 10, 2008. This model run projects water level and drawdown for the Chicot aquifer to 2059. Based on this GAM run, after 60 years, water level elevations and declines at STP are projected to be between an elevation of 0 and +25 feet, and 0 and 10 feet, respectively (Reference 2.3.1-XX+4). Based on current use and drawdown and results from both GAMs, groundwater availability does not appear to be an issue at STP. Groundwater availability is discussed in Section 2.3.2.

The following change to the end of ER Section 2.3.1.2 is recommended to insert the citations referenced in this response:

2.3.1-XX "Estimating Groundwater Availability in Texas," Mace, Robert E, William F. Mullican, III, and Ted Way; Texas Water Development Board, Austin, Texas, 2001.

2.3.1-XX+1 "A Streetcar Named Desired Future Conditions: The New Groundwater Availability for Texas," Mace, Robert E, Rima Petrossian, Robert Bradley, and William F. Mullican, III, State Bar of Texas 7th annual the changing face of water rights in Texas, Chapter 3.1; Texas Water Development Board, Austin, Texas, 2006.

2.3.1-XX+2 "Groundwater Management Plan, Prepared for: Coast Plains Groundwater Conservation District," Turner Collie & Braden, Inc., May 2004.

2.3.1-XX+3 "Evaluation of Ground-Water Flow and Land-Surface Subsidence Caused by Hypothetical Withdrawals in the Northern Part of the Gulf Coast Aquifer System, Texas," USGS, Scientific Investigations Report 2005-5024, U.S. Department of the Interior, U.S. Geological Survey Reston, Virginia, 2005.

2.3.1-XX+4 "GAM Run 07-36, Texas Water Development Board Groundwater Availability Modeling Section, 2008.

RESPONSE:

Question (2):
A breakdown of the total projected water demands into groundwater and surface water amounts (ER Table 2.3.2-6) for Region K was not provided in the Water for Texas 2007 beyond 2010. The Water for Texas 2007 water plan does estimate that in 2010 surface water will provide approximately 77% and groundwater 23% of water demand (TWDB 2006). The requested data was also not included in the Lower Colorado Regional Water Planning Group's 2006 Water Plan or in the Coastal Plains Groundwater conservation District's 2004 Groundwater Management Plan.

As discussed in the response to Question 1, the groundwater use projections for Matagorda County for 2060 were estimated based on historical TWDB and USGS data. The projections are estimated to be 32,500 acre-feet and 42,000 acre-feet. Both of these estimates are below the estimated groundwater availability amount of 49,221 acre-feet (RAI 2.3-12) for Matagorda County. The RAI 2.3-12 response includes a discussion of the STPNOC groundwater permit value of 3000 acre-feet per year and the impacts to the available groundwater (49,221 acre-feet per year) of the Gulf Coast Aquifer in Matagorda County projected through 2060.

As discussed in ER Section 4.2, the projected groundwater use for STP 3 & 4 construction activities would be 1200 gallons per minute (gpm). Normal operations are projected to require 1077 gpm of groundwater water while maximum use operations would require 3935 gpm of groundwater. Using groundwater up to the current permitted amount (1860 gpm) for construction activities and operations requiring groundwater would use the remainder of the permit or approximately 1062 gpm. Short term water demand could be met by increasing the yield of the existing wells or installing new wells.

ER Subsections 4.2.2 and 5.2.2.2 discuss the fact that STPNOC used groundwater at an average rate of 798 gpm from 2001 through 2006. Based on the current STPNOC groundwater permit value of 3000 acre-feet per year (approximately 1860 gpm), STP 3 & 4 would use the remaining permit amount or approximately 1062 gpm [1860 gpm - 798 gpm (1713 acre-feet per year) during construction activities and operations with the remainder of the water needs for STP 3 & 4 being met through water supplied by the MCR. Therefore, the percent increase in groundwater use during construction and operation of STP 3 & 4 of approximately 1062 gpm (1713 acre-

feet/year) would represent approximately 3.5 % of the 49,221 acre-feet per year of available groundwater in Matagorda County in the year 2060. The use of 3000 acre-feet per year would represent 0.9% of the available groundwater in the region (RAI 2.3-12 Response Table E) and 6.1% of the available groundwater in the Gulf Coast Aquifer in Matagorda County (RAI 2.3-12 Response Table F) through 2060.

The Lower Colorado Regional Water Planning Group (LCRWPG) is currently making plans for the conjunctive use of groundwater and surface water in order to effectively use available water resources. The combined use of these two resources would be conducted to minimize the use of groundwater when surface water is available and managing aquifers for sustainable yield (LCRWPG 2006). This would allow surface water to be used as the major source of water within the region during wet periods. During periods of drought, however, groundwater would be used, even to the point of limited overdrawing the resource during drought, if necessary, and allowing the resource to recharge during non-drought periods (LCRWPG 2006).

CANDIDATE COLA REVISION (Question 2):

No COLA revision is required as a result of this response.

Question 2.3-12

QUESTION:

Provide an analysis of the sustainable groundwater resource.

Full Text (Supporting Information):

Question (1)
ER Section 2.3.1.2.4.3, states "Water demand could be met by increasing the yield of the existing wells or installing new wells with the objective that total STP use would not exceed the 3000 acre-ft per year permitted amount. A detailed evaluation of groundwater availability and estimates of aquifer drawdown, water conservation measures, and identification of alternative sources, if practicable, will be addressed as part of the detailed engineering for STP 3 & 4." Similar statements appear in other sections.

NRC independent analysis and evaluation of the groundwater resource include its availability for the plant and the plant's impact upon it. The analysis addresses the potential impact of the current 3000 acre-feet per year permitted amount. An analysis is needed of the sustainable groundwater resource (e.g., safe yield) available from plant's groundwater source, the Deep Aquifer portion of the Chicot aquifer. The groundwater impacts analysis cannot be deferred until completion of detailed engineering.

Question (2)
The concept of the sustainable groundwater resource (e.g., safe yield or available groundwater resource) should be described in Section 2.3.1; once included, it could then be used (1) in Section 2.3.2.2 Groundwater Use to quantitatively describe the groundwater resource available to STP today and in the future, (2) in Section 2.3.2.2.1 Onsite Use to describe the available groundwater resource, (3) in Section 4.2.2 Water Use Impacts to quantitatively describe the STP groundwater use during construction in light of the sustainable or available groundwater resource in the region, (4) in Section 5.2.2 Water Use Impacts to quantitatively describe the STP groundwater use during operation in light of the sustainable or available groundwater resource in the region, and (5) in Section 10.5S.1.2, Hydrology and Water Use, to quantitatively describe the proposed STP usage compared to the sustainable or available groundwater resource to assess the cumulative impacts to the groundwater resource.

RESPONSE:

Question (1)
The Texas Water Development Board (TWDB) has proposed to use consensus yield, which considers science, policy, socio-economics, and stakeholder involvement, over safe or optimal yield when estimating groundwater availability (Mace and others, 2001). The TWDB also urges planning groups to use Groundwater Availability Models (GAMs) to estimate groundwater availability of aquifers (Mace and others, 2006). Estimates of groundwater availability are

planning tools; not pumping limits (Mace and others, 2001). Ultimately, however, groundwater in Texas is governed by the local groundwater conservation districts where they exist, and rules of capture where these agencies do not exist. The rule of capture grants a landowner or locally governed Groundwater Conservation Districts (GCD) the right to capture the water beneath a property to the extent the water is available regardless of the effect the pumping may have on neighboring water wells (TAMU, 2006). GCDs are in place to maintain balance between water users, prevent waste, and prevent irreparable harm to the aquifer. Management plans and permitting are being developed to control groundwater use in Texas.

Matagorda County lies within the Coastal Plains Groundwater Conservation District (CPGCD), which functions within Texas Groundwater Management Area 15, and is affiliated with the Lower Colorado Regional Water Planning Group-Region K (LCRWPG). The CPGCD regulates groundwater use permits to manage the groundwater resources in Matagorda County. Following the passing of House Bill 1763 on September 1, 2005, groundwater availability numbers provided in groundwater plans prepared by the local groundwater conservation districts, such as the CPGCD, must be used by the regional water planning group (Mace and others, 2006).

STP withdraws about 1,200 to 1,300 acre-feet per year (AF/Y) of groundwater from five Deep Aquifer production wells to support the operation of existing Units 1 & 2. Normal operations with four reactors on the site would require approximately 3,000 AF/Y of groundwater. The CPGCD has granted STP a permit to withdraw 3,000 AF/Y of groundwater from the Deep Aquifer to support plant operations.

Groundwater is projected to be the main source of water for STP 3 & 4 plant construction and operation. STPNOC currently uses about 1300 acre-ft per year for plant operations at the STPEGS. Therefore, approximately 1700 acre-ft per year (1050 gpm) of groundwater could be available for construction use. Water demand could be met by increasing the yield of the existing wells or by installing new wells with the objective that total STP use would not exceed the 3000 acre-ft per year permitted amount. Operation of STP 3 & 4 is predicted to require a typical groundwater consumption of about 1080 gpm or about 1740 acre-ft per year, whereas the peak groundwater consumption for STP 3 & 4 is expected to be as great as 3935 gpm, when required (i.e., outages). The projected combined STP plant normal groundwater consumption for STP 1 & 2 and STP 3 & 4 is expected to be between about 2940 and 3040 acre-ft per year, which is approximately equal to the permitted use of 3000 acre-ft per year. Peak demand for outages could be met by increasing the permitted groundwater allotment for short-term uses or by obtaining water from other sources such as the MCR or the Colorado River. As with STP 1 & 2, it is expected that no sustained pumping will be permitted within 4000 ft of the plant safety-related facility areas in order to minimize the potential for regional subsidence resulting from lowering of the Deep Aquifer zone potentiometric head. Based on this requirement, the location of the additional groundwater wells required for expanded plant operations would most likely be located in the northwestern and northeastern sections of the STP site and/or in the southeastern and southwestern site areas adjacent to the MCR. Two to three new wells may be required.

The CPGCD Groundwater Management Plan (approved by the TWDB on September 10, 2004) states that LCRWPG estimated 49,221 AF/Y of usable groundwater is available from the Gulf Coast aquifer (includes the Chicot) in Matagorda County (Turner Collie & Braden, Inc., 2004).

Between 1980 and 2000, the average groundwater withdrawal in Matagorda County from the Gulf Coast aquifer was reported to be 30,233 AF/Y, and the projected groundwater supply in 2050 is estimated to be 35,785 AF/Y (Turner Collie & Braden, Inc., 2004), which is less than the available 49,221 AF/Y. However, the CPGCD states that there was little science utilized in the development of this number, and does not attest to its accuracy (Turner Collie & Braden, Inc., 2004). The TWDB-approved 2060 County Water Demand Projection for Matagorda County is 286,093 AF/Y. However, this includes both surface water and groundwater use, which complicates the development of a separate surface water and groundwater availability prediction from the total water use projections for Matagorda County.

The water projection numbers are constantly being revised by TWDB, CPGCD, GWM 15, Regional K, USGS and other researchers. It has been stated that, "like beauty, availability is in the eye of the beholder" (Mace and others, 2001). The CPGCD, using LCRWPG estimates, indicates that the projected demands will exceed projected supplies (combined surface water and groundwater use) in the future. Water conservation strategies and desalination of sea water and deeper brackish groundwater have been proposed by the LCRWPG. TWDB is working on these issues but, as stated previously, STP has a permit for 3,000 AF/Y for groundwater withdrawal to support operations.

Groundwater availability projections are also available for Matagorda County from runs of the GAMs executed for the north and the central Gulf Coast aquifer system. The north Gulf Coast aquifer GAM consists of the finite-difference computer code MODFLOW96 with the Interbed-Storage Package to simulate clay compaction and storage for land-surface subsidence prediction in the Chicot and Evangeline aquifers (USGS, 2005). This model consists of four layers to simulate the Chicot, Evangeline, and Jasper aquifers and the Burkeville confining unit discretized into finite difference grids that cover 33,565 square miles (mi^2) in southeastern Texas and southwestern Louisiana (USGS, 2005), which includes all of Matagorda County. Each layer consists of 137 rows and 245 columns that partition the model into 134,260 uniformly spaced cells of 1 mi^2 area each (USGS, 2005). The grid was rotated 37.6 degrees clockwise to orientate the model to be parallel to the Texas Gulf Coast and to more closely coincide with natural ground-water divides, model boundaries, and predevelopment and post-development flow paths (USGS, 2005). The nearest lateral model boundary to STP is a specified no-flow boundary used by the USGS to simulate the 10,000 mg/l total dissolved solids freshwater limit to the southeast near the Gulf of Mexico. This boundary reflects an assumption of a stable downdip freshwater/saline-water interface. This assumption is probably valid where long-term equilibrium between the freshwater and the saline water has been established outside of the Houston-Galveston area – where heavy pumping induced salt-water intrusion has occurred (USGS, 2005). The next nearest lateral boundary is to the southwest, where the model boundary equates with the Lavaca River (USGS, 2005); a major stream located about 25 miles southwest of STP. This indicates at least 25 model cells are present between STP and this edge of the model. Based on the USGS description of the model, it does not appear that these boundaries restrict the simulation at STP.

Results of this GAM run indicate water level elevations in the Chicot aquifer at STP are simulated to be slightly less than sea level in 2000, and using the TWDB water demand projections, decline to an elevation of -50 feet between 2010 and 2050. This is in agreement

with water levels observed in STP Deep Aquifer piezometers during 2005 and 2006 documented in ER Section 2.3.1 and illustrated by ER Figure 2.3.1-24.

A second MODFLOW-based GAM was prepared for the central Gulf Coast Aquifer by the TWDB. The latest run to include Matagorda County is GAM Run 07-36 completed January 10, 2008. This model run projects water level and drawdown for the Chicot aquifer to 2059. Based on this GAM run, after 60 years, water level elevations and declines at STP are projected to be between an elevation of 0 and +25 feet, and 0 and 10 feet, respectively (TWDB, 2008). Based on both GAMs, groundwater availability does not appear to be an issue at STP.

REFERENCES:

13) Mace, Robert E, Rima Petrossian, Robert Bradley, and William F. Mullican, III, , 2006, *A Streetcar Named Desired Future Conditions: The New Groundwater Availability for Texas*; State Bar of Texas 7th annual the changing face of water rights in Texas, Chapter 3.1; Texas Water Development Board, Austin, Texas, 7 p.

14) Mace, Robert E, William F. Mullican, III, and Ted Way, 2001, *Estimating Groundwater Availability in Texas*; Texas Water Development Board, Austin, Texas, 15 p.

15) Turner Collie & Braden, Inc., May 2004, *Groundwater Management Plan, prepared for: Coastal Plains Groundwater Conservation District*, 20 p.

16) USGS, 2005, *Evaluation of Ground-Water Flow and Land-Surface Subsidence Caused by Hypothetical Withdrawals in the Northern Part of the Gulf Coast Aquifer System, Texas*; Scientific Investigations Report 2005-5024, U.S. Department of the Interior, U.S. Geological Survey Reston, Virginia, 71p.

17) TAMU, 2006, *Priority Groundwater Management Areas, Overview and Frequently Asked Questions*; Texas Cooperative Extension, the Texas A&M University System, 34 p.

18) TDWR, 1985, Water use, projected water requirements, and related data and information for the metropolitan statistical areas in Texas: Texas Department of Water Resources Publication LP-201, 226 p.

19) TWDB, 2008, GAM Run 07-36; Texas Water Development Board Groundwater Availability Modeling Section, 47 p. including appendices.

20) USGS, 2005, *Bibliography of Ground-Water References for All 254 Counties in Texas, 1886-2001*; Open-File Report 2005-1270, U.S. Department of the Interior U.S. Geological Survey, Reston, Virginia, 321p.

CANDIDATE COLA REVISION:

To provide clarification to the discussion of groundwater availability provided in this response and groundwater use provided in the response to ER RAI 2.3-11, the following revision to the third paragraph and the addition of a subsequent paragraph of ER Section 2.3.1.2.4.3 will be made:

> Groundwater is projected to be the main source of makeup water for the STP 3 & 4 UHS, condensate makeup, radwaste and fire protection systems and the source of potable water for STP 3 & 4. These systems are predicted to require typical groundwater consumption of approximately 1738 acre-ft per year (1077gpm), whereas the peak consumption (i.e., outages) is expected to be as great as 3935 gpm. Short term water demand beyond the current capacity of the existing wells could be met by increasing the yield of the existing wells, installing new wells with the objective of increasing peak production while not exceeding the 3000 acre-ft per year permitted amount, or withdrawing the necessary additional water from the MCR. (Water from the MCR will only be used for makeup to the UHS cooling towers.) ~~A detailed evaluation of groundwater availability and estimates of aquifer drawdown, water conservation measures, and identification of alternative sources, if practicably, will be addressed as part of the detailed engineering for STP 3 & 4.~~
>
> The Texas Water Development Board (TWDB) has proposed to use consensus yield, which considers science, policy, socio-economics, and stakeholder involvement, over safe or optimal yield when estimating groundwater availability (Reference 2.3.1-XX). The TWDB also urges planning groups to use Groundwater Availability Models (GAMs) to estimate groundwater availability of aquifers (Reference 2.3.1-XX+1). Estimates of groundwater availability are planning tools; not pumping limits (Reference 2.3.1-XX). Ultimately, however, groundwater in Texas is governed by the locally governed Groundwater Conservation District (GCD) where they exist and rules of capture (landowner right to capture the water beneath their property) where GCDs do not exist.
>
> The concept of the sustainable groundwater resource (e.g., safe yield or available groundwater resource) for STP may be obtained from the CPGCD Groundwater Management Plan approved by TWDB on October 10, 2004 or from one of the GAMs that covers Matagorda County. The CPGCD Groundwater Management Plan states (Reference 2.3.1-XX+2):
>
> - The Regional Water Planning Group (Region K) estimates 49,221 acre-feet per year (AF/Y) of usable groundwater is available from the Gulf Coast aquifer in Matagorda County.
> - The average total groundwater withdrawn between 1980 and 2000 in Matagorda County from the Gulf Coast aquifer was 30,233 AF/Y.
> - The groundwater supply in Matagorda County is projected to be 35,785 AF/Y in 2050.

Further complicating the situation, the TWDB-approved total water demand projections are not presented with separate surface water and groundwater amounts. Using Region K estimates, CPGCD projects surface water and groundwater demand for Matagorda County will exceed projected supplies in the future. Water conservation strategies and desalination of deeper brackish groundwater have been proposed by Region K and the CPGCD to help met the projected demand.

Results of the North Gulf Coast Aquifer GAM, which consists of the finite-difference computer code MODFLOW96, indicate water level elevations in the Chicot aquifer at STP are simulated to be slightly less than sea level in 2000, and using the TWDB water demand projections, decline to an elevation of -50 feet between 2010 and 2050 (Reference 2.3.1-XX+3). This is in agreement with water levels observed in STP Deep Aquifer piezometers during 2005 and 2006 illustrated in Figure 2.3.1-24 and discussed in Section 2.3.1.2.3.4.

A second MODFLOW-based GAM, prepared for the Central Gulf Coast Aquifer by the TWDB, was rerun as GAM Run 07-36 in January 10, 2008. This model run projects water level and drawdown for the Chicot aquifer to 2059. Based on this GAM run, after 60 years, water level elevations and declines at STP are projected to be between an elevation of 0 and +25 feet, and 0 and 10 feet, respectively (Reference 2.3.1-XX+4). Based on current use and drawdown and results from both GAMs, groundwater availability does not appear to be an issue at STP. Groundwater availability is discussed in Section 2.3.2.

The following change to the end of ER Section 2.3.1.2 is recommended to insert the citations referenced in this response:

2.3.1-XX "Estimating Groundwater Availability in Texas," Mace, Robert E, William F. Mullican, III, and Ted Way; Texas Water Development Board, Austin, Texas, 2001.

2.3.1-XX+1 "A Streetcar Named Desired Future Conditions: The New Groundwater Availability for Texas," Mace, Robert E, Rima Petrossian, Robert Bradley, and William F. Mullican, III, State Bar of Texas 7th annual the changing face of water rights in Texas, Chapter 3.1; Texas Water Development Board, Austin, Texas, 2006.

2.3.1-XX+2 "Groundwater Management Plan, Prepared for: Coast Plains Groundwater Conservation District," Turner Collie & Braden, Inc., May 2004.

2.3.1-XX+3 "Evaluation of Ground-Water Flow and Land-Surface Subsidence Caused by Hypothetical Withdrawals in the Northern Part of the Gulf Coast Aquifer System, Texas," USGS, Scientific Investigations Report 2005-5024, U.S. Department of the Interior, U.S. Geological Survey Reston, Virginia, 2005.

2.3.1-XX+4 "GAM Run 07-36, Texas Water Development Board Groundwater Availability Modeling Section, 2008.

RESPONSE:

Question (2)
Section 2.3.2.2 Groundwater available to the LCRA is presented in Table 2.3.2-A. (See tables below.) The amount of groundwater available within the LCRA Region K for year 2000 was 350,336 acre-feet per year. The projected groundwater available for the region for year 2060 is 349,347 acre-feet per year. The Coastal Plain Groundwater Conservation District (CPGCD) seeks to manage the groundwater resources of the District as practicably as possible in a sustainable manner. In order to achieve the sustainable management of groundwater in the District, the annual amount of useable groundwater available is currently designated as equal to the amount of effective annual recharge to the Gulf Coast aquifer within the District. The CPGCD does not report availability/sustainability by aquifer layer within the Gulf Coast aquifer. The estimated amount of groundwater available in Matagorda County (Table 2.3.2-B) is currently 49,221 acre-feet per year through 2060. This is also the projected availability for the Colorado River basin within Matagorda County through 2060. Current water demand for Matagorda County (Table 2.3.2-C) is projected to be 292,146 acre-feet per year for 2010 and 286,093 acre-feet per year for 2060. The average groundwater use in Matagorda County from 1990 through 2004 is 30,714 (Table 2.3.2-D).

As discussed in ER Section 2.3.2, from 2001 through 2006, STP used from 745 gpm (1202 acre-feet/year) to 863 gpm (1392 acre-feet/year) from the gulf Coast Aquifer within the Colorado River Basin. The current STP groundwater use for Units 1 & 2 represents from 0.3 to 0.4% (Table 2.3.2-E) of the Lower Colorado Regional Water Planning Area (Region K) available groundwater through 2060.

Section 4.2.2 The combined STP groundwater use for construction activities for Units 3 & 4 and for continued operation of Units 1 & 2 would be limited to the current groundwater permit value of 3000 acre-feet per year. The use of 3000 acre-feet per year would represent 0.9% of the available groundwater in the region (Table 2.3.2-E) and 6.1% of the available groundwater in the Gulf Coast Aquifer in Matagorda County (Table 2.3.2-F) through 2060.

Surface water from the MCR will be used if site groundwater demands during the operation of Units 1 & 2 and the construction and operations of Units 3 & 4 appear to exceed the current permitted groundwater use value. (Water from the MCR will only be used for makeup to the UHS cooling towers.) Groundwater impacts to availability would be SMALL and not warrant mitigation.

Section 5.2.2 The combined STP groundwater use for the operation of Units 3 & 4 and for continued operation of Units 1 & 2 would be limited to the current groundwater permit value of 3000 acre-feet per year. The use of 3000 acre-feet per year would represent 0.9% of the available groundwater in the region (Table 2.3.2-E) and 6.1% of the available groundwater in the Gulf Coast Aquifer in Matagorda County (Table 2.3.2-F) through 2060.

Surface water from the MCR will be used if site groundwater demands during the operation of Units 1 through 4 appear to exceed the current permitted groundwater use value. (Water from the MCR will only be used for makeup to the UHS cooling towers.) Groundwater impacts to availability would be SMALL and not warrant mitigation.

Section 10.5S.1.2 The maximum projected groundwater use for the STP Units 1 through 4 would be limited to the current groundwater permit value of 3000 acre-feet per year (1860 gpm). The use of 3000 acre-feet per year would represent 0.9% of the available groundwater in the region and 6.1% of the available groundwater in the Gulf Coast Aquifer in Matagorda County through 2060. Therefore, groundwater impacts to availability would be SMALL and not warrant mitigation.

CANDIDATE COLA REVISION:

No COLA revision is required as a result of this response.

Question (2) response tables 2.3.2-A through 2.3.2-F follow.

Table 2.3.2-A
Groundwater and Surface Water Supplies Available to the LCRWPG

Supply Source	Available Supply (acre-feet per year)		
	Year 2000	**Year 2030**	**Year 2060**
Groundwater			
Gulf Coast Aquifer	198,425	198,425	198,425
Carrizo-Wilcox Aquifer	28,400	28,400	28,400
Edwards Aquifer (Balcones Fault Zone)	8,375	8,375	8,375
Trinity Aquifer	16,782	16,440	15,717
Edwards-Trinity (Plateau) Aquifer	1,657	1,657	1,659
Hickory Aquifer	27,380	27,380	27,380
Queen City Aquifer	3,991	3,991	3,991
Sparta Aquifer	9,889	9,889	9,889
Ellenburger-San Saba Aquifer	23,574	23,574	23,574
Marble Falls Aquifer	18,305	18,305	18,305
Other Aquifer [1]	13,558	13,611	13,632
Groundwater Subtotal	**350,336**	**350,047**	**349,347**
Surface Water [2]			
Brazos River Basin	566	566	566
Brazos-Colorado Coastal River Basin [3]	9,649	9,787	9,894
Colorado River Basin [4]	910,730	902,857	904,652
Colorado-Lavaca Coastal River Basin	4,289	4,289	4,289
Lavaca River	4,671	4,671	4,671
Guadalupe River Basin [5]	903	903	903
Surface Water Subtotal	**930,808**	**923,073**	**924,975**
Supplies from other regions [6]	**2,127**	**713**	**1,041**
Total LCRWPA Water Availability	**1,283,271**	**1,273,833**	**1,275,363**

Reference: LCRWPG 2006

Notes:
1 Other Aquifer refers to alluvial aquifer water supplies.
2 Includes local supplies determined from 2001 Plan.
3 Includes a water right from the San Bernard River with unconfirmed reliability.
4 Includes firm supplies determined from "No Call" Colorado River WAM for reservoirs and run-of-river water rights.
5 Includes firm supplies determined from Guadalupe River Basin WAM.
6 Includes groundwater and surface water from the Brazos, Colorado, and Guadalupe River.

Table 2.3.2-B
Groundwater availability in the Gulf Coast Aquifer Counties Located in Region K (acre-feet/year)

County	Basin	Year 2000	Year 2010	Year 2020	Year 2030	Year 2040	Year 2050	Year 2060
Colorado	Brazos-Colorado	11,506	11,506	11,506	11,506	11,506	11,506	11,506
Colorado	Colorado	17,436	17,436	17,436	17,436	17,436	17,436	17,436
Colorado	Lavaca	18,915	18,915	18,915	18,915	18,915	18,915	18,915
	County Total	**47,857**	**47,857**	**47,857**	**47,857**	**47,857**	**47,857**	**47,857**
Fayette	Brazos	65	65	65	65	65	65	65
Fayette	Colorado	3,300	3,300	3,300	3,300	3,300	3,300	3,300
Fayette	Guadalupe	144	144	144	144	144	144	144
Fayette	Lavaca	5,188	5,188	5,188	5,188	5,188	5,188	5,188
	County Total	**8,697**	**8,697**	**8,697**	**8,697**	**8,697**	**8,697**	**8,697**
Matagorda	Brazos-Colorado	22,423	22,423	22,423	22,423	22,423	22,423	22,423
Matagorda	Colorado	3,218	3,218	3,218	3,218	3,218	3,218	3,218
Matagorda	Colorado-Lavaca	23,580	23,580	23,580	23,580	23,580	23,580	23,580
	County Total	**49,221**	**49,221**	**49,221**	**49,221**	**49,221**	**49,221**	**49,221**
Wharton	Brazos-Colorado	42,295	42,295	42,295	42,295	42,295	42,295	42,295
Wharton	Colorado	41,812	41,812	41,812	41,812	41,812	41,812	41,812
Wharton	Colorado-Lavaca	8,543	8,543	8,543	8,543	8,543	8,543	8,543
		92,650	**92,650**	**92,650**	**92,650**	**92,650**	**92,650**	**92,650**
Region K	**Region Total**	**198,425**	**198,425**	**198,425**	**198,425**	**198,425**	**198,425**	**198,425**

Reference: LCRWPG 2006

Table 2.3.2-C
Water Demand for Matagorda County (acre-feet/year)

Regional Projections	2000	2010	2020	2030	2040	2050	2060
Municipal Water Demand	5423	5590	5830	5906	5883	5815	5762
Manufacturing Water Demand	10,355	12,180	13,253	13,991	14,686	15,259	16,267
Irrigation Water Demand	205,990	193,048	186,072	179,353	172,916	166,722	160,750
Steam-Electric Water Demand	65,948	80,000	80,000	102,000	102,000	102,000	102,000
Mining Water Demand	196	177	172	169	167	165	163
Livestock Water Demand	1151	1151	1151	1151	1151	1151	1151
Total Water Demand	**289,063**	**292,146**	**286,478**	**302,570**	**296,803**	**291,112**	**286,093**

Reference: LCRWPG 2006

Table 2.3.2-D
Annual Surface and Groundwater Use 1990 - 2004
Matagorda County

Year	Source	Municipal	Manufacturing	Steam Electric	Irrigation	Mining	Livestock	Total
1990	GW	5,225	3,514	1,158	26,717	250	673	37,537
1990	SW	0	3,293	34,757	168,825	0	447	207,322
	Total	**5,225**	**6,807**	**35,915**	**195,542**	**250**	**1,120**	**244,859**
1991	GW	4,906	4,028	879	26,172	295	687	36,967
1991	SW	0	2,686	13,031	166,168	0	458	182,343
	Total	**4,906**	**6,714**	**13,910**	**192,340**	**295**	**1,145**	**219,310**
1992	GW	4,982	4,037	1,036	18,086	266	614	29,021
1992	SW	0	4,882	28,380	162,680	0	409	196,351
	Total	**4,982**	**8,919**	**29,416**	**180,766**	**266**	**1,023**	**225,372**
1993	GW	5,190	4,834	776	16,827	266	634	28,527
1993	SW	0	4,346	6,918	195,879	0	423	207,566
	Total	**5,190**	**9,180**	**7,694**	**212,706**	**266**	**1,057**	**236,093**
1994	GW	4,902	6,560	833	12,382	273	694	25,644
1994	SW	0	3,360	23,330	241,826	0	463	268,979
	Total	**4,902**	**9,920**	**24,163**	**254,208**	**273**	**1,157**	**294,623**
1995	GW	4,977	6,579	1,201	22,481	277	604	36,119
1995	SW	0	5,991	37,392	261,684	0	402	305,469
	Total	**4,977**	**12,570**	**38,593**	**284,165**	**277**	**1,006**	**341,588**
1996	GW	5,460	7,534	1,457	21,781	277	1,048	37,557
1996	SW	0	3,002	38,905	253,533	0	698	296,138
	Total	**5,460**	**10,536**	**40,362**	**275,314**	**277**	**1,746**	**333,695**
1997	GW	4,867	5,764	1,386	1,581	251	564	14,413
1997	SW	0	2,846	12,156	122,924	0	376	138,302
	Total	**4,867**	**8,610**	**13,542**	**124,505**	**251**	**940**	**152,715**
1998	GW	5,137	4,733	1,333	2,249	196	676	14,324
1998	SW	0	2,933	20,924	174,951	0	452	199,260
	Total	**5,137**	**7,666**	**22,257**	**177,200**	**196**	**1,128**	**213,584**
1999	GW	5,170	4,686	1,240	3,119	196	676	15,087
1999	SW	0	3,656	25,217	242,648	0	452	271,973
	Total	**5,170**	**8,342**	**26,457**	**245,767**	**196**	**1,128**	**287,060**
2000	GW	5,819	2,649	1,313	17,283	481	943	28,488
2000	SW	0	7,706	59,712	140,603	0	628	208,649
	Total	**5,819**	**10,355**	**61,025**	**157,886**	**481**	**1,571**	**237,137**

Table 2.3.2-D
Annual Surface and Groundwater Use 1990 - 2004 (Continued)
Matagorda County

Year	Source	Municipal	Manufacturing	Steam Electric	Irrigation	Mining	Livestock	Total
2001	GW	5,051	3,210	4,965	13,794	131	285	27,436
2001	SW	0	6,019	43,547	177,159	0	898	227,623
	Total	**5,051**	**9,229**	**48,512**	**190,953**	**131**	**1,183**	**255,059**
2002	GW	4,716	3,488	4,439	13,751	131	278	26,803
2002	SW	0	6,541	38,930	111,261	0	874	157,606
	Total	**4,716**	**10,029**	**43,369**	**125,012**	**131**	**1,152**	**184,409**
2003	GW	5,155	3,490	4,439	41,954	131	338	55,507
2003	SW	0	6,545	38,930	151,200	0	1,064	197,739
	Total	**5,155**	**10,035**	**43,369**	**193,154**	**131**	**1,402**	**253,246**
2004	GW	4,955	4,979	4,656	32,196	131	362	47,279
2004	SW	0	9,335	40,836	154,625	0	1,140	205,936
	Total	**4,955**	**14,314**	**45,492**	**186,821**	**131**	**1,502**	**253,215**
Reference: TWDB 2008								
Average Groundwater Annual Use 1990-2004			**30,714**	**acre-feet/year**				
Average Surface Water Annual Use 1990-2004				**218084**	**acre-feet/year**			

Table 2.3.2-E
STP Proposed Use of Available Regional Groundwater

	Acre-feet/yr	Available Regional (K) Groundwater (Acre-feet/Yr)			Percent STP Use of Available Regional (K) Groundwater		
		Year 2000	Year 2030	Year 2060	Year 2000	Year 2030	Year 2060
STP Current Water Use Units 1 & 2	1202-1392	350,336	350,047	349,347	0.3 – 0.4%	0.3 – 0.4%	0.3 – 0.4%
roposed Construction Water Use and Units 1 & 2 operation	3000	350,336	350,047	349,347	0.9%	0.9%	0.9%
roposed Operations Units 1 through 4	3000	350,336	350,047	349,347	0.9%	0.9%	0.9%

Notes: Data compiled from tables above and ER Section 2.3.2.

Table 2.3.2-F
STP Proposed Use of Available Matagorda County Groundwater

	Acre-feet/yr	Available Groundwater in Matagorda County (Gulf Coast Aquifer) (Acre-feet/Yr)			Percent STP Use of Available Groundwater in Matagorda County (Gulf Coast Aquifer)		
		Year 2000	Year 2003	Year 2060	Year 2000	Year 2030	Year 2060
'P Current Water Use Units 1 & 2	1202-1392	49,221	49,221	49,221	2.4 – 2.8%	2.4 – 2.8%	2.4 – 2.8%
posed Construction Water Use and Units 1 & 2 operation	3000	49,221	49,221	49,221	6.1%	6.1%	6.1%
posed Operations Units 1 through 4	3000	49,221	49,221	49,221	6.1%	6.1%	6.1%

Notes: Data compiled from tables above and ER Section 2.3.2.

Question 2.3-15

QUESTION:

Provide definitive information regarding known or assumed tritium sources.

Full Text (Supporting Information):

Regarding the field observations of tritium in the REMP wells in 2005 and 2006, identify whether there are known or assumed tritium sources or both. If the MCR is the source, then provide the rationale for is occurrence (e.g., MCR water has infiltrated into the shallow aquifer through windows in the clay sequences underlying the MCR, or it related to relief well operation). If it is from other operational releases or from offsite, then provide the bases.

RESPONSE:

Tritium is produced during operation of Units 1 & 2. Some of the tritium produced in the reactors is released into the atmosphere. The remainder is released to the MCR. Tritium is removed from the MCR by evaporation, direct infiltration into the shallow aquifer from the MCR, and by percolation to the shallow aquifer from waters released from the relief wells that are a part of the dike's stabilization system located within the MCR dike (STPNOC 2008).

REFERENCES:

STPNOC (South Texas Project Nuclear Operating Company) 2008. 2007 Annual Environmental Operating Report. South Texas Project Electric Generating Station. April. P. 6-8.

CANDIDATE COLA REVISION:

No COLA revision is required as a result of this response.

Question 2.4.2-2

QUESTION:

Describe the aquatic habitat features at the RMPF.

Full Text (Supporting Information):

Describe the habitat features at the RMPF. Include the sediment types and channel features. Relate the habitat features to the flow characteristics of the river (e.g., the movement of the salt water wedge). Are the aquatic resources likely to be attracted to the shoreline at the RMPF? Does the RMPF provide habitat for aquatic resources? Discuss how habitat features affected the sampling activities (e.g., use of seines, etc. in the vicinity of the RMPF).

RESPONSE:

In the vicinity of the RMPF, the main channel is located in the approximate center of the river, roughly the same distance from east and west banks. The bottom configuration is a broad U, with both banks sloping steeply down to a roughly 25-foot-deep channel. This channel configuration is maintained by periodic dredging. The bottom depth at the trash rack is roughly 20 feet deep, extending out about 15 feet into the river, then sloping down to about 25 feet across most of the river bottom where it rises quickly out of the channel again about 15 feet from shore. The substrate in the area of the RMPF is comprised mostly of silt and sand. The ENSR biologist who led the 2007-2008 field surveys estimates, based on field observations, that the bottom is about 70% silt and 30% sand.

The location and movement of the salt wedge is determined by river discharge and tidal amplitude. Based on historical measurements of salt-water intrusion at depth, it appears that the more-saline water is typically at depths of 3 or 4.5 meters (10-15 feet), suggesting that the fresher, less-dense water is typically found from surface to 10-15 foot depths. Given the bottom configuration described in the previous paragraph, this means that roughly the bottom half of the water column would exhibit the high salinity condition. Table 2 of the response to RAI 2.3-5 presents the range of bottom salinities measured in the vicinity of STP.

The shoreline habitat adjacent to the RMPF can be described as steep banks associated with erosional features and sediment deposits. Vegetation is very limited due to these effects. There is a significant amount of brush piles and log debris. The shoreline in the vicinity of the RMPF is unremarkable, looking very much like the shoreline up- and down-river. Similarly, the fish habitat in the vicinity of the RMPF appears to be no better or worse in the vicinity of the RMPF than anywhere else in this reach of the river.

As for the RMPF itself, it probably does attract fish under certain conditions. First, fish may seek the refuge afforded by the RMPF structure during periods of high river flow. But there are many areas in the river that provide similar refuges from currents, including deep holes and log

jams and brush piles and holes in banks, and there's no reason to think that fish would select the shelter of the RMPF over any of these other refuges during floods. Based on the fact that Lower Colorado River fishermen have traditionally fished lighted areas (such as docks) at night, because fish are known to congregate in these lighted areas, it is conceivable that the lights of the RMPF attract fish.

As discussed in Section 2.1 of the *Aquatic Ecology – Colorado River Monitoring Report* (ENSR 2008), ENSR chose its sampling locations randomly within a given river reach. Having selected the location, ENSR biologists employed gear appropriate to the habitat and for species that are known to occur within each of these habitats. For example, a bag seine might be used in an area of the river that was relatively shallow and flat, whereas an otter trawl pulled behind a boat might be used in a deeper portion of the river.

CANDIDATE COLA REVISION:

No COLA revision is required as a result of this response.

Question 2.5-2

QUESTION:

Update population and growth rates based on post-2000 Census data.

Full Text (Supporting Information):

2000 Census data can now be supplemented with later information from Texas demographic sources and the American Community Survey. The information on population between censuses is expected to be supplemented from other sources if available. Does the availability of 5-6 years of additional estimated population data change any of the forecasts of population geographic distribution, growth rates, or ethnic composition? If not, state why. If so, provide revised values for the affected distributions and growth rates.

RESPONSE:

Population and growth rates provided in Section 2.5.1 of the ER were based on the methodology and projections made by the Office of the State Demographer for Texas. The methodology (shown as ER Figure 2.5-3 and described in Reference 2.5-6) uses a rigorous approach that examines age, ethnic, and racial cohorts and offers several scenarios regarding migration into the area. This methodology uses data collected from public records on births, deaths, and migration. Population estimates after the 2000 Census do not capture age, ethnic, and racial data at the county or sub-county level. These distinctions are important in certain analyses, such as Environmental Justice and various analyses related to safety concerns. Therefore, these forecasts are used within all socioeconomic sections, because it is important to use consistent projections throughout the ER. The suggested use of information from years between censuses, such as from the American Community Survey, would not be consistent with this approach.

CANDIDATE COLA REVISION:

[add the following footnote to the paragraph introducing Section 2.5.1.1]:

In general, the U.S. Census Bureau is the preferred source of information for use in socioeconomic analyses because it provides a greater level of consistency across geopolitical boundaries than other data sources. Bureau information is based on the direct collection of information, while other information sources often rely either on some form of the Bureau information or on proxies such as telephone and electrical connections to households and businesses. The information for a particular variable provided by local and state agencies or private vendors can differ, sometimes significantly, because of the use of different methods, source data, level of detail, and terminology. In addition, Census Bureau information is readily available and updated population estimates are available annually.

Question 2.5-7

QUESTION:

Provide a discussion of changes to anticipated levels of traffic identified by state transportation planners for Matagorda and surrounding counties.

Full Text (Supporting Information):

Based on staff interviews with local government officials, both US Highway 60 and FM 521 in particular were very crowded during construction of STP Unit 1&2. Provide data regarding capacity and use information on the highways and transportation systems to identify potential choke points in the transportation net, as well as any plans to relieve those choke points.

RESPONSE:

Changes to anticipated levels of traffic will be most pronounced in Matagorda County, as 60.7% of the construction employees are expected to reside in this county. Brazoria County is estimated to account for 22.4% while the other surrounding counties will account for the remaining 16.9%. Matagorda County will see the highest impact of an estimated additional 8,330 individuals (workers and their families). There will be an estimated additional 5950 vehicles on the road in Matagorda County. Possible mitigation measures are discussed below.

Data regarding capacity:
Table 2.5-12 will be revised to reflect new traffic calculations for capacity, provided by the Traffic Data and Analysis Manual, Texas Department of Transportation, September 2001.

Potential Choke points and mitigation plans:
The potential choke point of primary interest will be the intersection of FM 1468 and FM 521 in Matagorda County. Construction traffic will minimize disruption of existing traffic patterns by entering the site via the north where FM 1468 and FM 521 intersect, or the west entrance off FM 521. The current STP workforce will enter primarily via the east entrance off FM 521, as usual.

Additional mitigation measures could include the installation of turning lanes at the construction entrance, a centralized parking area away from the site, shuttle service for construction workers to the site in buses or vans, workforce carpools, and staggering shift changes to avoid overlap and reduce congestion with operation shift workers.

The TxDOT Transportation Planning and Programming Division will be the regulatory agency ultimately responsible for any road alterations and upgrades within the area.

CANDIDATE COLA REVISION:

Section 2.5.2, Table 2.5-12:

Table 2.5-12

Statistics for Most Likely Routes to the STP Site

	Roadway and Location [1]	Number of Lanes	Type	TXDOT Road Classification	Average Annual Daily Traffic (AADT) for 2005 [2]	Threshold Capacity (passenger cars per hour) [3]
	Matagorda County					
1	Highway 60 south to FM 521 west	2	Undivided	~~State Highway (U)~~ Rural Major Collector	3880	2,300
2	FM 2078 west to FM 2668 south	2[4]	Undivided	~~Farm-to-Market (R)~~ Rural Minor Arterial	450	4,200
3	FM 2668 south to FM 521 west	2	Undivided	~~Farm-to-Market (R)~~ Rural Major Collector	1100	2,300
4	FM 521 west to Highway 35 west	2	Undivided	~~Farm-to-Market (R)~~ Rural Major Collector	1330	2,300
5	FM 1468 south to FM 521 east	2[4]	Undivided	~~Farm-to-Market (R)~~ Rural Minor Arterial	600	4,200
6	FM 1095 south to FM 521 east	2	Undivided	~~Farm-to-Market (R)~~ Rural Major Collector	480	2,300
7	FM 2853 south to FM 521 east	2	Undivided	~~Farm-to-Market (R)~~ Rural Major Collector	580	2,300
8	FM 521 west	2	Undivided	~~Farm-to-Market (R)~~ Rural Major Collector	2530	2,300
9	FM 521 east	2	Undivided	~~Farm-to-Market (R)~~ Rural Major Collector	1543	2,300

Source: Reference 2.5-16

[1] The traffic counts (AADTs) identified on Fig. 2.5-5 correspond to those listed in this table

[2] Traffic counts for a 24-hour time period

~~R=Rural; U=Urban~~

~~Source: Reference 2.5-17~~

[3]Capacity used in travel demand modeling by TXDOT, metropolitan planning organizations, and local governments. The capacity is typically based on level of service C (stable flow) based on the Transportation Research Board *Highway Capacity Manual*. Level of service A or B (free flow to reasonably free flow) may also be used as the threshold capacity level in less congested urban areas. (TXDOT Sep 2001)

[4] Rural Minor Arterial value form Suburban Fringe column

Question 2.5-15

QUESTION:

Discuss the outcome of the Moak, Casey, and Associates study and provide a copy.

Full Text (Supporting Information):

The staff has learned that NRG has contracted Moak, Casey, and Associates of Austin, TX to prepare a study of the economic impact of STP 3 and 4 on local school finances. Summarize and provide a copy of the study.

RESPONSE:

NOTE: Although this RAI is tied to Section 2.5.2, it should be addressed in Section 5.8.2 because it concerns the impacts of STP 3 & 4 operations. Therefore, the COLA revision below is to Section 5.8.2.2.2. A copy of the study is provided in the enclosed CD.

CANDIDATE COLA REVISION:

The following change is to Section 5.8.2.2.2, Property Taxes – Independent School Districts. The last two paragraphs of that section should be replaced with the following:

The Texas Economic Development Act (Act) gives Texas school districts the ability to attract large capital investment by granting a limitation on the taxable value of such investments (Tax Abatement). The State Legislature expanded the Act in 2007 to allow investments in nuclear power plants to qualify for Tax Abatement by school districts (Amended Act). The actual legislation was HB2994. (Reference 5.8-9). On November 1, 2007, NRG submitted its Application for Appraised Value Limitation on Qualified Property for STP Unit 3 to the Palacios ISD for this abatement. Moak, Casey & Associates of Austin, Texas, prepared a study of the fiscal impacts of this application for the Palacios ISD (Reference 5.8-14).

Palacios Independent School District (PISD) received NRG Energy's application for tax abatement re: "Application for Appraised Value Limitation on Qualified Property" for STP Unit 3 and Unit 4 on July 30, 2007 and amended on November 1, 2007 at the request of the Texas Comptroller's Office, where NRG Energy divided the original application into two applications, one for Unit 3 and one for Unit 4. Moak and Casey were contracted to conduct the fiscal and economic impact of the tax abatement agreement as a function of submission of the application to PISD in September 2007.

After the Texas Comptroller's Office issued their affirmative opinion letter on March 31, 2007, PISD Board of Trustees approved and signed the tax abatement agreement with NRG Energy on June 9, 2008. The findings of the PISD Board are summarized as follows:

- The Applicant (NRG) and the project (STP 3 & 4) meet the required long-term economic growth goals in terms of investment, job creation, and salary levels, and that the "subsequent economic effects on the local and regional tax bases will be significant. In addition, the impact of the added infrastructure will be significant in the region."
- The "economic condition of Matagorda County, Texas is in need of long-term improvement."
- The ISD has adequate capacity to add 200-300 students without additional facilities.
- The ISD would "incur an initial revenue loss without the proposed Agreement, especially in the fourth year of the Agreement. However, with this Agreement, the negative consequences of granting the abatement are offset through the revenue protection provisions agreed to by the Applicant and the District. Additional revenue protection measures are also in place for the duration of the Agreement."
- The Moak, Casey report found that the project would add $3.7 billion to the ISD's tax base, allowing a reduction in the I&S (debt service) tax rate from $0.15 to $0.04 with the addition of STP 3 & 4, and to $0.0615 with just the addition of STP 3.

In conclusion, the Board found that "it is in the best interest of the District" to enter into the Agreement.

It is anticipated that the long term positive economic impact of this project on the state and local community will far exceed any initial foregone tax revenue.

Question 2.5-18

QUESTION:

Clarify contents and provide copies of references 2.5-14, 2.5-15, and 2.5-17.

Full Text (Supporting Information):

Staff could not locate the information on road quality purported to be in reference documents 2.5-14 and 2.5-15. Reference 2.5-15 was not accessible on 1-16-2008. Provide a copy of reference 2.5-17 "Yoakum District Highway Traffic Map," TXDOT, 2005. Transportation Planning and Programming Division.

RESPONSE:

References 2.5-14 and 2.5-17 are provided on the enclosed CD (Enclosure 1).

Reference 2.5-15 has been changed to 2.5-17. Reference 2.5-15 can be deleted.

Reference 2.5-14 is also available online at:

http://www.txcip.org/tac/census/profile.php?FIPS=48321

Reference 2.5-17, 2005 District Highway Traffic Map, Yoakum District can also be requested from TxDOT, Department of Transportation Planning and Programming Division via the TxDOT website locations listed below:

http://www.txdot.gov/contact_us/transportation_planning_and_programming.htm
http://www.txdot.gov/contact_us/?id=tpp-email

CANDIDATE COLA REVISION:

Section 2.5.2.2.2, Page 2.5-9, paragraph 5 on the page.

Table 2.5-11 shows the highway mileage in Matagorda and Brazoria Counties. Of a total 3675 miles of road, 8% are state routes, 47% are country roads, 31% are city streets, 12% are farm or ranch to market roads, and the remaining 1% are pass, parks, recreation, and frontage roads (Reference 2.5-~~15~~ 17).

Question 2.5-21

QUESTION:

Estimate the degree of congestion for key road links approaching STP.

Full Text (Supporting Information):

Clarify the relationship between Texas "esal"-based road capacity and level-of-service measurements commonly used to estimate congestion, and provide LOS estimates for the key locations on the highway map and table for which AADT are reported.

RESPONSE:

Congestion is expected to be most evident at the intersection of FM 1468 and FM 521 during the day/night shift change (peak travel time). It is estimated that 7226 vehicles will be at this intersection during the shift change, exceeding the peak travel road limit of 5520 vehicles. The traffic congestion and disruption of current traffic patterns will be alleviated by the use of STP's east entrance for current STP employees, while construction traffic will be directed to the west plant entrance off FM 521 or the north where FM 1468 and FM 521 intersect.

TXDOT uses a "functional class" system instead of LOS to base road capacity numbers. (See updated Table 2.5-12 included in RAI 2.5-7).

CANDIDATE COLA REVISION:

Section 2.5.2.2.4 (Page 2.5-10)

Vehicle volume on the roads, as measured by AADT counts within a 24-hour period and the "Functional Class" system, reflect the urban and rural character of the counties. In Matagorda County, which is primarily rural, AADT counts are generally equivalent throughout the county. There is no Transportation Research Board "Level of Service" determination for these Texas roads (Reference 2.5-17) ~~and~~ however TXDOT ~~does not~~ maintains capacity data for these roads, ~~but~~ using ~~measures usage (AADT) and weight/load limit (in esals)~~ the functional class system.

Question 2.5-22

QUESTION:

Describe planned road upgrades on the commuting routes to STP.

Full Text (Supporting Information):

In the course of offsite interviews, staff has become aware of several potential upgrades in the vicinity of Bay City. Are any upgrades actually planned for the transportation system in Matagorda County?

RESPONSE:

According to the Texas Department of Transportation (TXDOT) there are only two projects in Matagorda County:

- Bridge upgrade currently underway on FM 521 over the Lower Colorado River.
- Bridge upgrade currently underway in the town of Matagorda, TX, over the Gulf Intracoastal Waterway.

CANDIDATE COLA REVISION:

No COLA revision is required as a result of this response.

Question 2.5-23

QUESTION:

Discuss the environmental and socioeconomic impacts of upgrading the rail spur.

Full Text (Supporting Information):

Is upgrading the 9-mile rail spur into the STP site a commitment of the STPNOC? If so, discuss the environmental and socioeconomic impacts of upgrading the rail spur.

RESPONSE:

The STP rail spur would be repaired, not upgraded. Most of the large equipment will be delivered by barge. If it is decided to repair the existing rail spur, it will be at a later date and it is not an ER commitment.

Environmental impacts of upgrading the rail spur:
Environmental impacts could consist of increase in noise and vibrations, possible erosion issues, possible air quality issues, wetland protection issues and storm water drainage issues.

Protective measures would include a summary of environmental requirements for construction that would be prepared for relevant environmental requirements, including but not limited to a listing of the specific permit requirements for STP 3 & 4, the titles of the individuals responsible for ensuring compliance with each requirement, and the calendar or scheduled activity start dates by which compliance with each requirement must be completed and the current status of each action item. Additional information can be found in Section 3.9S.2.

Socioeconomic impacts of upgrading the rail spur:
Socioeconomic impacts would be primarily reflected in traffic along FM 521 where the rail spur would cross the roadway and continue to Buckeye. During the construction phase this could have an impact on local and plant traffic causing temporary delays. Scheduling rail deliveries during off-peak travel time is a possible mitigation. As construction activities decline and operations activities increase the traffic impacts from rail traffic on the rail spur will become less pronounced and will be minimal as FM 521 is a rural roadway and traffic is minimal.

The ER contains no commitments. Mitigation measures should not be considered commitments, but options to be considered if the need arises.

CANDIDATE COLA REVISION:

No COLA revision is required as a result of this response.

Question 2.5-24

QUESTION:

Discuss seasonal low water issues with using the STP barge slip.

Full Text (Supporting Information):

Are there seasonal low water issues in using the STP barge slip? How will they be overcome?

RESPONSE:

The barge slip for the South Texas Project is within the tidal reaches of the Gulf of Mexico. The U. S. Army Corps of Engineers maintains a navigable channel from the Gulf Intracoastal Waterway upriver beyond the STP barge slip to the Port of Bay City as shown on NOAA Chart 11319. The depth of this navigable channel from the Intracoastal Waterway to the barge slip is subject primarily to normal tidal variations. Therefore, seasonal low water issues do not impact use of the STP barge slip. Data showing the normal tidal variation is available from USGS and other sources.

The Navigation Channel depths for the Colorado River Extension are shown on NOAA Chart 11319:

> "The controlling depth from the junction with the Intracoastal Waterway to Mile 2 was 7 1/2 feet for a width of 100 feet, thence 4 feet for a mid-width of 50 feet to mile 13.5, thence 2 1/2 feet for a mid-width of 50 feet to the turning basin, with 9 1/2 feet for the right 75 feet in the turning basin. Jan. 2008 - Feb. 2008".

The barge slip will be dredged out to the center channel of the river in accordance with Texas General Land Office easement provisions.

CANDIDATE COLA REVISION:

No COLA revision is required as a result of this response.

Question 2.5-29

QUESTION:

Provide revenue and expenditure data for the City of Palacios.

Full Text (Supporting Information):

Are data available on revenues and expenditures in the City of Palacios, similar to the data provided for Bay City?

RESPONSE:

Data are available on revenues and expenditures in the City of Palacios. The paragraph, tables, and figures shown below will be included in the revised draft of ER 2.5.2.

CANDIDATE COLA REVISION:

Section 2.5.2.3.6: The following paragraph will be inserted between the paragraph for the City of Bay City and Matagorda County.

The City of Palacios

Unlike Bay City, the City of Palacios receives approximately half of its revenues from property taxes, accounting for 50.6% of 2007's total revenues of $1.8 million. The Palacios proposed budget for 2008 showed a 31.4% increase in property tax revenues over the adopted budget for 2007. In Palacios, whose population as of the 2000 Census was roughly one-fourth the size of Bay City's (Reference 2.5-3), sales taxes accounted for only 12.1% of total revenues, reflecting the much smaller retail sector. Table 2.5-43 and Figure 2.5-23 illustrate Palacios revenues by source. Total budgeted expenditures in Palacios for 2007 were nearly $2.2 million, with 37.4% spent on public safety, 21.2% on general government, and 22.1% on Infrastructure and Environmental Services. Expenditures by category are summarized in Table 2.5-44 and shown in Figure 2.5-24.

Table 2.5-43 City of Palacios Revenues by Source, 2006

Source	2007[1]	Percent of Total
Property Taxes and Penalties	$ 916,360.00	50.6%
Sales Taxes	219,500.00	12.1%
Franchise Taxes	140,000.00	7.7%
Licenses and Permits	14,000.00	0.8%
Fines and Forfeitures	100,500.00	5.6%
Fees and Charges for Services	95,940.00	5.3%
Intergovernmental	303,560.00	16.8%
Interest on Investments	8,000.00	0.4%
Other	12,000.00	0.7%
Total	**$ 1,809,860.00**	**100.0%**

Source: Ref 2.5.2-109 [Palacios 2007-2008 Budget, 2008]
[1] Adopted Budget, 2006-2007

Table 2.5-44 City of Palacios Expenditures by Function, 2006

Function	2007[1]	Percent of Total
General Government	$ 460,280.00	21.2%
Justice System	91,870.00	4.2%
Public Safety	810,060.00	37.4%
Infrastructure and Environmental Services	479,380.00	22.1%
Community Services	189,300.00	8.7%
Other	137,100.00	6.3%
Total	**$ 2,167,990.00**	**100.0%**

Source: Ref 2.5.2-109 [Palacios 2007-2008 Budget, 2008]
[1] Adopted Budget, 2006-2007

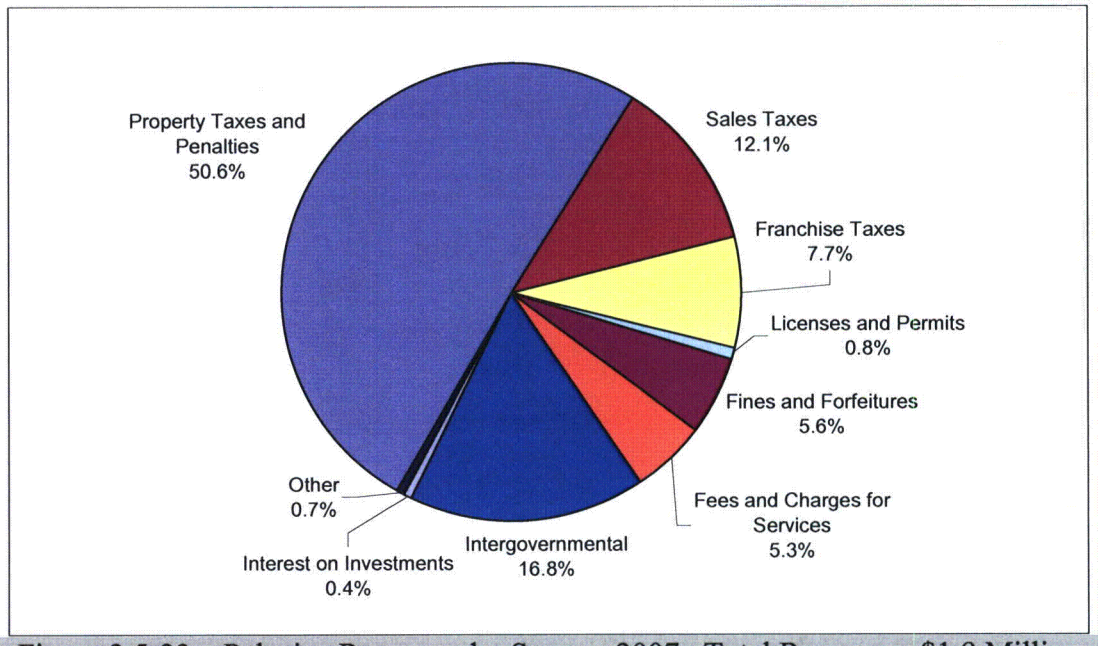

Figure 2.5-23. Palacios Revenues by Source, 2007 Total Revenues: $1.8 Million

Source: Ref 2.5.2-109 [Palacios 2007-2008 Budget, 2008]

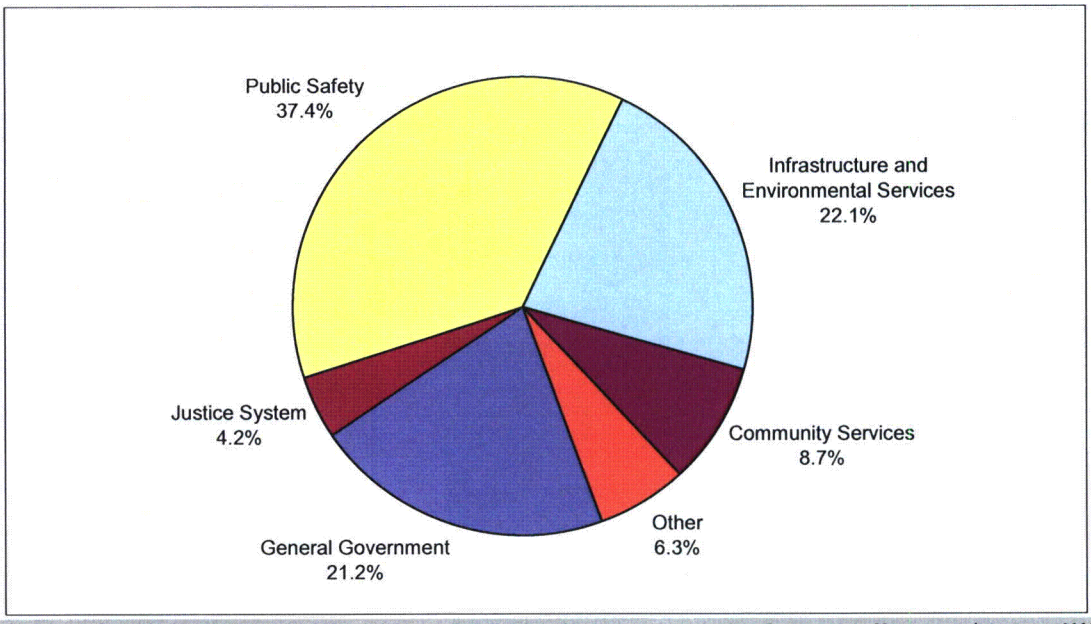

Figure 2.5-24- Palacios Expenditures by Function, 2007 Total Expenditures: $2.2 Million

Source: Ref 2.5.2-109 [Palacios 2007-2008 Budget, 2008]

Question 2.7-1

QUESTION:

Provide a climatological summary of the STP meteorological data.

Full Text (Supporting Information):

According to ER Section 6.4, meteorological measurements have been made at the STP site for more than 30 yrs. These data should provide a better climatological description of the STP site than the 30-yr normal climatological data for Victoria, 53 miles from the STP site and other data listed in Sections 2.7.1, 2.7.3, and 2.7.4 of the ER. Is there reason to believe that NWS data collected at Victoria is more representative of site conditions than the data collected at STP?

RESPONSE:

Site-specific measurements have been included in ER Section 2.7 for atmospheric dispersion-related parameters (i.e., wind speed, wind direction, and atmospheric stability). However, mean and extreme statistics for other directly-measured parameters (i.e., temperature, atmospheric moisture, rainfall, and snowfall), based on data from nearby, offsite climatological observing stations, are considered to meet the intent of Paragraph 2 under the "Data and Information Needs" heading in the ESRP for ER Section 2.7 (i.e., to represent "expected long-term conditions at and near the site").

As shown in ER Table 2.7-3, among the 15 nearby meteorological stations, Point Comfort has the highest mean temperature (71.1°F). This value is higher than the mean temperature recorded at the STP site (69.5°F). Table 2.7-4 presents maximum and minimum temperatures at the 15 nearby stations. The table indicates Pierce 1E station recorded both the highest (112°F) and the lowest (4°F) temperatures. An analysis was performed to investigate the site specific meteorological parameters during a 17 year period (1990 - 2006). The maximum (103.7°F) and minimum (23.6°F) temperatures recorded at the STP site are bounded by those measured at Pierce 1E station. Additionally, the STP site average wind speed (4.1 m/s) is lower than the average wind speed reported at Victoria (4.3 m/s) (see Table 2.7-6). These findings indicate that the above regional climatological values envelop the site values.

Mean and extreme statistics based on long-term ambient temperature, atmospheric moisture, and rainfall measurements made at the STP site, while important, do not represent the entire picture when trying to describe expected long-term conditions at and near the site. At the same time, not including such data does not preclude these characteristics from being adequately described. Regarding extreme maximum and minimum temperatures, the historical data for the stations considered indicate that synoptic-scale conditions are responsible for periods of record-setting excessive heat as well as significant cold air outbreaks that tend to affect the overall STP site area. The general similarity of the respective extremes suggests that these statistics are representative of the STP site area (see ER Subsection 2.7.1.3.1).

Atmospheric moisture monitoring at the STP site consisted of dew point temperature measurements. In response to an RAI for FSAR Section 2.3, it was determined that over the 17-year period from 1990 to 2006 dew point temperatures were not available between 1/1/1990 and 9/7/1994 and that during the period from 2001 through 2006, 37 percent of the dew point temperatures were not available. Dew point temperatures reported for the Victoria, Texas NWS station (see ER Subsection 2.7.1.3.2 and ER Table 2.7-2) appear to be slightly lower than at the STP site due to the proximity of the site to the Gulf of Mexico.

Precipitation events (rain and snow) are well recognized as being point observations and highly variable over short distances such that it would not be appropriate, from a climatological standpoint, to characterize mean or extreme conditions expected at the STP on the basis of measurements made only at the site. As a result, the characteristics identified to be representative of the STP site consider measurements made at all of the identified observation stations in the site area (see ER Subsection 2.7.1.3.3) including the onsite monitoring facilities.

CANDIDATE COLA REVISION:

The fourth (next to last) paragraph of Subsection 2.7.1.1 will be modified as shown below:

First-order NWS stations also record measurements, typically on an hourly basis, of other weather elements, including winds, several indicators of atmospheric moisture content (i.e., relative humidity, dew point, and wet-bulb temperatures), and barometric pressure, as well as other observations when those conditions occur (e.g., fog, thunderstorms). ~~Although the Victoria weather station is located 53 miles to the west of the STP site, the terrain between the STP site and the Victoria station is relatively flat.~~ The Victoria, Texas NWS station, ~~is~~ the closest first-order station to the STP site, ~~and although it~~ is located 53 miles to the west of the STP site at approximately the same latitude. The terrain between the STP site and the Victoria NWS station is relatively flat. ~~Additionally, the Victoria station is located at almost the same latitude as the STP site. Therefore,~~ The long-term (30 years) data from the Victoria station was used to describe the general climatic conditions at the STP site. Table 2.7- 2, excerpted from the 2005 local climatological data (LCD) summary for the Victoria, Texas NWS station, presents the long-term characteristics of these parameters.

Question 2.7-2

QUESTION:

Discuss the likelihood that the combination of the MCR and the STP Unit 3 & 4 cooling towers will have a synergistic effect that increases the frequency or intensity of fog.

Full Text (Supporting Information):

Sections 2.7.4.1 and 5.3.3.1.2 of the ER discuss fogging from the MCR and from the proposed cooling towers for Units 3&4 as if they were completely independent when, in fact, they are in close proximity and are in operation simultaneously. Therefore, it is appropriate to consider the cumulative effects of the MCR and the cooling towers; provide the cumulative effects analysis.

RESPONSE:

The Ultimate Heat Sink (UHS) design described in Revision 1 of the STP 3 & 4 COLA is being modified. The following RAI response applies to the UHS design as currently described in COLA Revision 1. This response will be updated, if necessary, following completion of the UHS design modification, which will be presented in the next revision of the COLA.

As indicated in Environmental Report (ER) Section 2.7.4.1 the potential for fog was assessed for one year prior to Unit 1 operation and for one year after the commercial operation of STP Unit 2. The results indicate that there was not a significant increase in fog occurrence with both units operating compared to the naturally occurring fogging that was present prior to the operation of either unit. Based on this, it was concluded there was no increase in fog occurrence beyond the 33 hours identified in reference 2.7-29.

It is further concluded in ER 2.7.4.1 that the addition of Units 3 & 4 would still be insignificant and any impacts would be small since the increase in temperature in the MCR would be minimal. The study of Units 3 & 4 UHS cooling towers utilizing a SACTI analysis did not predict any fog to occur from the cooling towers. The cooling towers are approximately ½ mile from the nearest point on the MCR and approximately two (2) miles from the center of the MCR. As such, they can be considered independent for fogging as results from measurement on the MCR demonstrated insignificant levels of fog and analysis of cooling towers predicted no fogging.

Because the STP 3 & 4 UHS cooling towers operate at maximum capacity under emergency conditions and at a much lower capacity for non-essential loads under normal conditions, interaction is considered unlikely. Further, FSAR Section 9.2.5.4.2 indicates that the cooling towers may be partially or fully bypassed during cold weather operation. At the same time fog is recorded most often during the November-March winter season when normal daily minimum temperatures are relatively lower.

Based on this discussion, the zero fogging from cooling towers combined with minimal number of hours of annual MCR fogging indicated above represents a negligible cumulative amount of fogging. Further, the fogging associated with a pond or MCR is a low level localized climatological event (ground fog) whereas, the cooling tower plume is elevated at a much higher level than the pond surface.

CANDIDATE COLA REVISION:

No COLA revision is required as a result of this response.

Question 2.7-3

QUESTION:

Describe which PAVAN files were used and how the 50% χ/Q values were derived.

Full Text (Supporting Information):

Section 2.7.5.2 of the ER contains χ/Q values for the evaluating the impacts of design basis accidents. The NRC staff independently reviewed the PAVAN output files submitted by STPNOC; it is unclear how the 50% χ/Q values were determined from the PAVAN output files. Provide a description of the process to determine the 50% values from the PAVAN output.

RESPONSE:

Due to limitations of the PAVAN code, 5% overall site X/Q values for varying source-to-receptor distances cannot be calculated in a single run. Since the distance to the exclusion area boundary (EAB) from the center of STP 3 & 4 is different for each directional sector, 16 different runs (one for each EAB distance for the corresponding direction sector) were made. The maximum 5% X/Q value was then selected from the 16 runs. To be conservative, for each run, the shortest distance from either the STP 3 reactor building or the STP 4 reactor building to the EAB was used as input for each downwind sector to calculate the X/Q values at the EAB. Based on the results of the 16 runs (see Table 1), the maximum 5% overall site X/Q was found to occur in the northwest direction. The shortest source-to-receptor distance (930 m) is associated with this maximum X/Q value.

According to the ordered X/Q-frequency values generated in the same run at this shortest source-to-receptor distance (930 m), the 50% X/Q value is 4.2E-05 (see Table 2). The annual average X/Q value, as shown in the corresponding summary table generated by PAVAN, is 1.80E-05 (see Table 3).

To estimate X/Q values for other intermediate averaging periods, the logarithmic interpolation approach (Appendix A of Reference 1) implemented in the PAVAN code was used. The same approach was used to estimate X/Q values for various averaging periods at the LPZ. X/Q values for the intermediate averaging periods were logarithmically interpolated between the maximum 0-2 hour 5% and annual X/Q values. Presented in Table 4 are the estimated X/Q values for various averaging periods using the above methodology but replacing the 0-2 hour 5% X/Q value with the 50% X/Q value. This approach is conservative because the 0-2 hour 50% X/Q value was selected from the sector that has the maximum overall site 5% X/Q. Additionally, the annual X/Q value used to estimate intermediate averaging periods was also selected from the PAVAN-generated summary table that is associated with the maximum overall site 5% X/Q.

REFERENCES:

Bander, T.J. 1982. *PAVAN: An Atmospheric Dispersion Program for Evaluating Design Basis Accidental Releases of Radioactive Materials for Nuclear Power Stations,* NUREG/CR-2858, U.S. Nuclear Regulatory Commission, Washington, D.C.

CANDIDATE COLA REVISION:

No COLA revision is required as a result of this response.

South Texas Project Ground Level Release PAVAN Output - Summary of Distance-Specific Exclusion Area Boundary 5% Overall Site X/Q Distribution

SITE EXCLUSION AREA BOUNDARY CALCULATIONS - BUILDING WAKE CREDIT IS NOT INCLUDED.
RELATIVE CONCENTRATION (X/Q) VALUES (SEC/CUBIC METER) VERSUS AVERAGING TIME

DOWNWIND SECTOR	DISTANCE (METERS)	0-2 HOURS	0-8 HOURS	8-24 HOURS	1-4 DAYS	4-30 DAYS	ANNUAL AVERAGE
N	1014	1.75E-04	1.17E-04	9.57E-05	6.19E-05	3.32E-05	1.54E-05
NNE	1142	1.53E-04	1.01E-04	8.22E-05	5.24E-05	2.75E-05	1.25E-05
NE	1443	1.19E-04	7.49E-05	5.93E-05	3.58E-05	1.74E-05	7.15E-06
ENE	1790	9.64E-05	5.73E-05	4.42E-05	2.52E-05	1.12E-05	4.16E-06
E	2056	8.60E-05	4.93E-05	3.73E-05	2.04E-05	8.58E-06	2.97E-06
ESE	2243	8.01E-05	4.49E-05	3.36E-05	1.80E-05	7.29E-06	2.42E-06
SE	2250	7.99E-05	4.48E-05	3.35E-05	1.79E-05	7.25E-06	2.40E-06
SSE	2002	8.79E-05	5.07E-05	3.85E-05	2.12E-05	9.03E-06	3.17E-06
S	1840	9.42E-05	5.56E-05	4.27E-05	2.41E-05	1.06E-05	3.89E-06
SSW	1650	1.04E-04	6.31E-05	4.92E-05	2.86E-05	1.32E-05	5.09E-06
SW	1372	1.26E-04	7.99E-05	6.38E-05	3.90E-05	1.93E-05	8.15E-06
WSW	1085	1.62E-04	1.08E-04	8.77E-05	5.63E-05	2.98E-05	1.37E-05
W	998	1.81E-04	1.21E-04	9.90E-05	6.40E-05	3.42E-05	1.59E-05
WNW	976	1.85E-04	1.24E-04	1.02E-04	6.61E-05	3.55E-05	1.66E-05
NW	**930**	**1.96E-04**	**1.32E-04**	**1.08E-04**	**7.06E-05**	**3.82E-05**	**1.80E-05**
NNW	952	1.91E-04	1.28E-04	1.05E-04	6.84E-05	3.69E-05	1.73E-05
	Maximum	**1.96E-04**	**1.32E-04**	**1.08E-04**	**7.06E-05**	**3.82E-05**	**1.80E-05**

Table 2 50% X/Q Value

ORDERED X/Q-FREQUENCY VALUES, AND AS PLOTTED ON A LOG-NORMAL GRAPH.)

CHI/Q SEC/CUBIC METER	PERCENT OF TIME CHI/Q IS EQUALED OR EXCEEDED WITH RESPECT TO THE TOTAL TIME	WHEN THE WIND BLOWS INTO THIS SECTOR ONLY
2.898E-04	1.000	1.000
2.242E-04	3.000	3.000
1.957E-04	5.000	5.000
1.441E-04	10.000	10.000
1.142E-04	15.000	15.000
9.510E-05	20.000	20.000
8.224E-05	25.000	25.000
7.218E-05	30.000	30.000
6.396E-05	35.000	35.000
5.704E-05	40.000	40.000
4.997E-05	45.000	45.000
4.196E-05	**50.000**	**50.000**
3.523E-05	55.000	55.000
2.949E-05	60.000	60.000
2.554E-05	65.000	65.000
2.259E-05	70.000	70.000
1.957E-04	5.0	5.00

Table 3 PAVAN-Generated Summary Table

PLANT NAME: STP - "NW" Distance
DATA PERIOD: 1997, 1999, 2000
TYPE OF RELEASE: Ground-Level Release
SOURCE OF DATA: Onsite
COMMENTS: Accidental Releases

METEOROLOGICAL INSTRUMENTATION
WIND SENSORS HEIGHT: 10.0 m
DELTA-T HEIGHTS: 10-m to 60-m

PROGRAM: PAVAN, 10/76, 8/79 REVISION, IMPLEMENTATION OF REGULATORY GUIDE 1.145

RELATIVE CONCENTRATION (X/Q) VALUES (SEC/CUBIC METER)
VERSUS
AVERAGING TIME

HOURS PER YEAR MAX
0-2 HR X/Q IS

SECTOR	DOWNWIND DISTANCE (METERS)	0-2 HOURS	0-8 HOURS	8-24 HOURS	1-4 DAYS	4-30 DAYS	ANNUAL AVERAGE IN SECTOR	EXCEEDED SECTOR
S	930.	1.90E-04	1.19E-04	9.37E-05	5.63E-05	2.71E-05	1.11E-05	24.3 S
SSW	930.	2.03E-04	1.33E-04	1.07E-04	6.73E-05	3.45E-05	1.53E-05	268.7 SSW
SW	930.	2.23E-04	1.46E-04	1.18E-04	7.43E-05	3.83E-05	1.71E-05	43.7 SW
WSW	930.	2.05E-04	1.33E-04	1.07E-04	6.64E-05	3.36E-05	1.46E-05	31.9 WSW
W	930.	2.00E-04	1.29E-04	1.04E-04	6.48E-05	3.28E-05	1.43E-05	28.2 W
WNW	930.	1.92E-04	1.27E-04	1.04E-04	6.63E-05	3.50E-05	1.60E-05	22.8 WNW
NW	930.	1.63E-04	1.13E-04	9.45E-05	6.36E-05	3.61E-05	1.80E-05	15.6 NW
NNW	930.	1.32E-04	9.09E-05	7.54E-05	5.03E-05	2.81E-05	1.38E-05	5.7 NNW
N	930.	9.36E-05	6.23E-05	5.08E-05	3.26E-05	1.73E-05	7.94E-06	3.3 N
NNE	930.	7.81E-05	4.65E-05	3.58E-05	2.04E-05	9.09E-06	3.38E-06	1.0 NNE
NE	930.	5.84E-05	3.25E-05	2.42E-05	1.28E-05	5.15E-06	1.68E-06	2.7 NE
ENE	930.	3.28E-05	1.88E-05	1.43E-05	7.81E-06	3.29E-06	1.14E-06	2.1 ENE
E	930.	6.61E-05	3.86E-05	2.95E-05	1.64E-05	7.09E-06	2.54E-06	7.8 E
ESE	930.	1.34E-04	7.87E-05	6.03E-05	3.39E-05	1.48E-05	5.38E-06	15.5 ESE
SE	930.	1.32E-04	7.91E-05	6.13E-05	3.53E-05	1.60E-05	6.06E-06	12.0 SE
SSE	930.	1.44E-04	8.89E-05	6.98E-05	4.14E-05	1.95E-05	7.77E-06	15.4 SSE
MAX X/Q		2.23E-04						TOTAL
HOURS AROUND SITE:	500.6							
SRP 2.3.4	930.	8.55E-04	4.52E-04	3.28E-04	1.64E-04	6.08E-05	1.80E-05	
SITE LIMIT		1.96E-04	1.32E-04	1.08E-04	7.06E-05	3.82E-05	1.80E-05	

Table 4 Logarithmic Interpolation for 50% X/Q

SLTime = [ln(50% X/Q) – ln(Annual X/Q)] x (-0.11926)

TimeInt = ln(50% X/Q) - (SLTime x 0.69315)

Y = 8, 16, 72, 624

XQT(Y) = SLTime x ln(Y) + TimeInt

X/Q(Y) = exp[XQT(Y)]

EXCLUSION AREA BOUNDARY			
50% X/Q	**Annual X/Q**	**SLTime**	**TimeInt**
4.20E-05	**1.80E-05**	-1.01E-01	-1.00E+01
0-8 hrs	**8-24 hrs**	**1-4 days**	**4-30 days**
XQT(8)	*XQT(16)*	*XQT(72)*	*XQT(624)*
-1.02E+01	-1.03E+01	-1.04E+01	-1.07E+01
X/Q(8)	*X/Q(16)*	*X/Q(72)*	*X/Q(624)*
3.65E-05	**3.40E-05**	**2.92E-05**	**2.35E-05**

LOW POPULATION ZONE			
50% X/Q	**Annual X/Q**	**SLTime**	**TimeInt**
4.95E-06	**6.54E-07**	-2.41E-01	-1.20E+01
0-8 hrs	**8-24 hrs**	**1-4 days**	**4-30 days**
XQT(8)	*XQT(16)*	*XQT(72)*	*XQT(624)*
-1.26E+01	-1.27E+01	-1.31E+01	-1.36E+01
X/Q(8)	*X/Q(16)*	*X/Q(72)*	*X/Q(624)*
3.54E-06	**3.00E-06**	**2.08E-06**	**1.24E-06**

Question 2.7-4

QUESTION:

Explain why the XOQDOQ results presented in the FSAR differ from the results presented in the ER.

Full Text (Supporting Information):

FSAR Section 2.3S.5.2 and ER Section 2.7.6.2 present results of long-term atmospheric dispersion and deposition calculations for use in evaluating the radiological consequences of normal reactor operation of Units 3&4. Please explain and justify why the radial distance and distance-segment boundary χ/Q and D/Q values presented in FSAR Tables 2.3S-28 and 2.3S-29 differ from the values presented in ER Table 2.7-16.

RESPONSE:

Results of long-term atmospheric dispersion and deposition values should be updated for ER Table 2.7-16 to be the same as those shown in FSAR 2.3S.5.2.

CANDIDATE COLA REVISION:

ER Table 2.7-16 will be replaced by the following table (4 sheets).

Table 2.7-16 XOQDOQ-Predicted Annual Average X/Q Values at the Standard Radial Distances and Distance-Segment Boundaries

No Decay X/Qs at Various Distances

REALEASE POINT - GROUND LEVEL - NO INTERMITTENT RELEASES
NO DECAY, UNDEPLETED
CORRECTED USING STANDARD OPEN TERRAIN FACTORS
ANNUAL AVERAGE CHI/Q (SEC/METER CUBED) DISTANCE IN MILES FROM THE SITE

SECTOR	.250	.500	.750	1.000	1.500	2.000	2.500	3.000	3.500	4.000	4.500
S	3.024E-05	9.780E-06	5.079E-06	2.601E-06	1.052E-06	5.737E-07	3.658E-07	2.567E-07	1.921E-07	1.504E-07	1.220E-07
SSW	4.092E-05	1.295E-05	6.688E-06	3.461E-06	1.420E-06	7.811E-07	5.015E-07	3.538E-07	2.659E-07	2.091E-07	1.701E-07
SW	4.526E-05	1.411E-05	7.274E-06	3.787E-06	1.565E-06	8.655E-07	5.577E-07	3.947E-07	2.974E-07	2.343E-07	1.909E-07
WSW	3.885E-05	1.214E-05	6.260E-06	3.256E-06	1.344E-06	7.423E-07	4.780E-07	3.380E-07	2.546E-07	2.005E-07	1.633E-07
W	3.799E-05	1.208E-05	6.311E-06	3.266E-06	1.338E-06	7.359E-07	4.722E-07	3.331E-07	2.502E-07	1.967E-07	1.600E-07
WNW	4.265E-05	1.383E-05	7.329E-06	3.766E-06	1.530E-06	8.360E-07	5.341E-07	3.754E-07	2.812E-07	2.205E-07	1.789E-07
NW	4.916E-05	1.643E-05	8.801E-06	4.462E-06	1.781E-06	9.619E-07	6.091E-07	4.251E-07	3.167E-07	2.471E-07	1.996E-07
NNW	3.826E-05	1.337E-05	7.195E-06	3.600E-06	1.413E-06	7.542E-07	4.735E-07	3.281E-07	2.430E-07	1.887E-07	1.517E-07
N	2.412E-05	8.121E-06	4.263E-06	2.104E-06	8.172E-07	4.335E-07	2.709E-07	1.871E-07	1.382E-07	1.070E-07	8.590E-08
NNE	1.015E-05	3.457E-06	1.819E-06	8.977E-07	3.486E-07	1.849E-07	1.156E-07	7.981E-08	5.893E-08	4.564E-08	3.664E-08
NE	5.005E-06	1.648E-06	8.572E-07	4.271E-07	1.679E-07	8.989E-08	5.656E-08	3.928E-08	2.915E-08	2.267E-08	1.827E-08
ENE	3.215E-06	1.088E-06	5.747E-07	2.885E-07	1.140E-07	6.122E-08	3.861E-08	2.686E-08	1.995E-08	1.554E-08	1.253E-08
E	6.872E-06	2.178E-06	1.131E-06	5.827E-07	2.379E-07	1.305E-07	8.360E-08	5.889E-08	4.421E-08	3.473E-08	2.823E-08
ESE	1.450E-05	4.452E-06	2.290E-06	1.191E-06	4.921E-07	2.720E-07	1.753E-07	1.240E-07	9.346E-08	7.365E-08	6.001E-08
SE	1.645E-05	5.201E-06	2.712E-06	1.396E-06	5.690E-07	3.117E-07	1.995E-07	1.405E-07	1.054E-07	8.273E-08	6.719E-08
SSE	2.145E-05	6.929E-06	3.598E-06	1.838E-06	7.415E-07	4.035E-07	2.570E-07	1.802E-07	1.347E-07	1.055E-07	8.545E-08

ANNUAL AVERAGE CHI/Q (SEC/METER CUBED) DISTANCE IN MILES FROM THE SITE

SECTOR	5.000	7.500	10.000	15.000	20.000	25.000	30.000	35.000	40.000	45.000	50.000
S	1.015E-07	5.336E-08	3.517E-08	2.067E-08	1.424E-08	1.070E-08	8.477E-09	6.970E-09	5.887E-09	5.075E-09	4.446E-09
SSW	1.420E-07	7.544E-08	5.008E-08	2.973E-08	2.062E-08	1.556E-08	1.238E-08	1.021E-08	8.650E-09	7.475E-09	6.562E-09
SW	1.596E-07	8.530E-08	5.684E-08	3.391E-08	2.361E-08	1.786E-08	1.424E-08	1.176E-08	9.976E-09	8.631E-09	7.585E-09
WSW	1.365E-07	7.287E-08	4.852E-08	2.892E-08	2.012E-08	1.522E-08	1.213E-08	1.002E-08	8.494E-09	7.348E-09	6.456E-09
W	1.335E-07	7.085E-08	4.700E-08	2.786E-08	1.931E-08	1.456E-08	1.157E-08	9.541E-09	8.076E-09	6.976E-09	6.121E-09
WNW	1.490E-07	7.856E-08	5.186E-08	3.054E-08	2.107E-08	1.583E-08	1.255E-08	1.032E-08	8.716E-09	7.514E-09	6.583E-09
NW	1.657E-07	8.616E-08	5.634E-08	3.276E-08	2.241E-08	1.673E-08	1.319E-08	1.080E-08	9.088E-09	7.808E-09	6.820E-09
NNW	1.254E-07	6.427E-08	4.159E-08	2.382E-08	1.613E-08	1.194E-08	9.353E-09	7.615E-09	6.376E-09	5.455E-09	4.746E-09
N	7.092E-08	3.620E-08	2.338E-08	1.337E-08	9.046E-09	6.700E-09	5.250E-09	4.277E-09	3.583E-09	3.067E-09	2.670E-09
NNE	3.024E-08	1.542E-08	9.945E-09	5.680E-09	3.843E-09	2.845E-09	2.229E-09	1.815E-09	1.521E-09	1.301E-09	1.133E-09
NE	1.513E-08	7.817E-09	5.092E-09	2.949E-09	2.016E-09	1.505E-09	1.187E-09	9.720E-10	8.182E-10	7.033E-10	6.145E-10
ENE	1.039E-08	5.380E-09	3.509E-09	2.034E-09	1.388E-09	1.035E-09	8.149E-10	6.666E-10	5.605E-10	4.813E-10	4.202E-10
E	2.355E-08	1.249E-08	8.280E-09	4.908E-09	3.403E-09	2.567E-09	2.042E-09	1.684E-09	1.426E-09	1.232E-09	1.081E-09
ESE	5.018E-08	2.684E-08	1.790E-08	1.069E-08	7.454E-09	5.644E-09	4.503E-09	3.723E-09	3.160E-09	2.735E-09	2.405E-09
SE	5.603E-08	2.965E-08	1.963E-08	1.161E-08	8.042E-09	6.060E-09	4.816E-09	3.969E-09	3.359E-09	2.900E-09	2.545E-09
SSE	7.110E-08	3.733E-08	2.458E-08	1.444E-08	9.947E-09	7.468E-09	5.917E-09	4.865E-09	4.109E-09	3.542E-09	3.103E-09

VENT AND BUILDING PARAMETERS:

RELEASE HEIGHT	(METERS)	.00	REP. WIND HEIGHT	(METERS)	10.0
DIAMETER	(METERS)	.00	BUILDING HEIGHT	(METERS)	37.7
EXIT VELOCITY	(METERS)	.00	BLDG.MIN.CRS.SEC.AREA	(SQ.METERS)	2134.0
			HEAT EMISSION RATE	(CAL/SEC)	.0

Table 2.7-16 XOQDOQ-Predicted Annual Average X/Q Values at the Standard Radial Distances and Distance-Segment Boundaries (Continued)

No Decay X/Qs at Various Segments

REALEASE POINT - GROUND LEVEL - NO INTERMITTENT RELEASES
NO DECAY, UNDEPLETED
CHI/Q (SEC/METER CUBED) FOR EACH SEGMENT

	SEGMENT BOUNDARIES IN MILES FROM THE SITE									
DIRECTION FROM SITE	.5-1	1-2	2-3	3-4	4-5	5-10	10-20	20-30	30-40	40-50
S	5.022E-06	1.184E-06	3.776E-07	1.947E-07	1.228E-07	5.597E-08	2.104E-08	1.075E-08	6.988E-09	5.083E-09
SSW	6.646E-06	1.590E-06	5.170E-07	2.694E-07	1.712E-07	7.896E-08	3.020E-08	1.564E-08	1.024E-08	7.485E-09
SW	7.243E-06	1.748E-06	5.746E-07	3.011E-07	1.922E-07	8.917E-08	3.443E-08	1.794E-08	1.179E-08	8.642E-09
WSW	6.231E-06	1.501E-06	4.925E-07	2.578E-07	1.644E-07	7.619E-08	2.937E-08	1.529E-08	1.004E-08	7.357E-09
W	6.239E-06	1.499E-06	4.869E-07	2.535E-07	1.611E-07	7.417E-08	2.831E-08	1.463E-08	9.564E-09	6.985E-09
WNW	7.191E-06	1.718E-06	5.511E-07	2.850E-07	1.802E-07	8.236E-08	3.107E-08	1.591E-08	1.034E-08	7.525E-09
NW	8.567E-06	2.013E-06	6.296E-07	3.212E-07	2.011E-07	9.059E-08	3.340E-08	1.683E-08	1.083E-08	7.821E-09
NNW	6.970E-06	1.606E-06	4.902E-07	2.466E-07	1.529E-07	6.778E-08	2.435E-08	1.202E-08	7.640E-09	5.465E-09
N	4.161E-06	9.326E-07	2.808E-07	1.403E-07	8.661E-08	3.822E-08	1.367E-08	6.746E-09	4.291E-09	3.073E-09
NNE	1.773E-06	3.979E-07	1.198E-07	5.983E-08	3.694E-08	1.628E-08	5.812E-09	2.865E-09	1.821E-09	1.304E-09
NE	8.418E-07	1.908E-07	5.853E-08	2.957E-08	1.841E-08	8.231E-09	3.011E-09	1.514E-09	9.748E-10	7.044E-10
ENE	5.616E-07	1.293E-07	3.994E-08	2.024E-08	1.263E-08	5.661E-09	2.075E-09	1.041E-09	6.686E-10	4.821E-10
E	1.120E-06	2.668E-07	8.622E-08	4.480E-08	2.842E-08	1.308E-08	4.988E-09	2.580E-09	1.688E-09	1.234E-09
ESE	2.282E-06	5.495E-07	1.806E-07	9.465E-08	6.041E-08	2.806E-08	1.086E-08	5.670E-09	3.731E-09	2.738E-09
SE	2.680E-06	6.384E-07	2.058E-07	1.068E-07	6.766E-08	3.106E-08	1.181E-08	6.091E-09	3.978E-09	2.904E-09
SSE	3.556E-06	8.349E-07	2.653E-07	1.366E-07	8.606E-08	3.917E-08	1.470E-08	7.509E-09	4.878E-09	3.547E-09

XOQDOQ - STP (1997, 1999, 2000 Met Data)

Table 2.7-16 XOQDOQ-Predicted Annual Average D/Q Values at the Standard Radial Distances and Distance-Segment Boundaries (Continued)

D/Qs at Various Distances

REALEASE POINT - GROUND LEVEL - NO INTERMITTENT RELEASES
CORRECTED USING STANDARD OPEN TERRAIN FACTORS
********** RELATIVE DEPOSITION PER UNIT AREA (M**-2) AT FIXED POINTS BY DOWNWIND SECTORS **********

DIRECTION FROM SITE	DISTANCES IN MILES .25	.50	.75	1.00	1.50	2.00	2.50	3.00	3.50	4.00	4.50
S	1.634E-07	5.526E-08	2.837E-08	1.349E-08	4.845E-09	2.403E-09	1.415E-09	9.265E-10	6.519E-10	4.831E-10	3.723E-10
SSW	1.631E-07	5.514E-08	2.831E-08	1.346E-08	4.835E-09	2.398E-09	1.412E-09	9.244E-10	6.505E-10	4.820E-10	3.715E-10
SW	1.446E-07	4.889E-08	2.510E-08	1.193E-08	4.286E-09	2.126E-09	1.252E-09	8.196E-10	5.767E-10	4.274E-10	3.293E-10
WSW	1.254E-07	4.242E-08	2.178E-08	1.035E-08	3.719E-09	1.844E-09	1.086E-09	7.111E-10	5.004E-10	3.708E-10	2.858E-10
W	1.460E-07	4.938E-08	2.535E-08	1.205E-08	4.330E-09	2.147E-09	1.264E-09	8.278E-10	5.825E-10	4.317E-10	3.327E-10
WNW	1.954E-07	6.607E-08	3.393E-08	1.613E-08	5.793E-09	2.873E-09	1.692E-09	1.108E-09	7.795E-10	5.776E-10	4.451E-10
NW	3.169E-07	1.072E-07	5.502E-08	2.616E-08	9.396E-09	4.660E-09	2.744E-09	1.797E-09	1.264E-09	9.369E-10	7.220E-10
NNW	3.229E-07	1.092E-07	5.607E-08	2.666E-08	9.575E-09	4.748E-09	2.796E-09	1.831E-09	1.288E-09	9.547E-10	7.357E-10
N	2.953E-07	9.987E-08	5.128E-08	2.438E-08	8.756E-09	4.342E-09	2.557E-09	1.674E-09	1.178E-09	8.731E-10	6.728E-10
NNE	1.134E-07	3.835E-08	1.969E-08	9.361E-09	3.363E-09	1.668E-09	9.819E-10	6.429E-10	4.524E-10	3.353E-10	2.584E-10
NE	4.764E-08	1.611E-08	8.272E-09	3.933E-09	1.413E-09	7.005E-10	4.125E-10	2.701E-10	1.900E-10	1.408E-10	1.085E-10
ENE	1.995E-08	6.746E-09	3.464E-09	1.647E-09	5.915E-10	2.933E-10	1.727E-10	1.131E-10	7.958E-11	5.898E-11	4.545E-11
E	2.487E-08	8.409E-09	4.318E-09	2.053E-09	7.373E-10	3.657E-10	2.153E-10	1.410E-10	9.920E-11	7.352E-11	5.666E-11
ESE	4.363E-08	1.475E-08	7.576E-09	3.602E-09	1.294E-09	6.416E-10	3.778E-10	2.474E-10	1.741E-10	1.290E-10	9.941E-11
SE	7.005E-08	2.369E-08	1.216E-08	5.782E-09	2.077E-09	1.030E-09	6.065E-10	3.971E-10	2.794E-10	2.071E-10	1.596E-10
SSE	1.234E-07	4.174E-08	2.143E-08	1.019E-08	3.660E-09	1.815E-09	1.069E-09	6.998E-10	4.924E-10	3.649E-10	2.812E-10

DIRECTION FROM SITE	DISTANCES IN MILES 5.00	7.50	10.00	15.00	20.00	25.00	30.00	35.00	40.00	45.00	50.00
S	2.958E-10	1.314E-10	7.959E-11	4.023E-11	2.435E-11	1.633E-11	1.170E-11	8.784E-12	6.830E-12	5.456E-12	4.453E-12
SSW	2.951E-10	1.311E-10	7.941E-11	4.014E-11	2.429E-11	1.629E-11	1.167E-11	8.764E-12	6.815E-12	5.443E-12	4.443E-12
SW	2.616E-10	1.162E-10	7.041E-11	3.559E-11	2.154E-11	1.444E-11	1.035E-11	7.770E-12	6.042E-12	4.826E-12	3.939E-12
WSW	2.270E-10	1.009E-10	6.109E-11	3.088E-11	1.869E-11	1.253E-11	8.979E-12	6.742E-12	5.242E-12	4.188E-12	3.418E-12
W	2.643E-10	1.174E-10	7.112E-11	3.595E-11	2.176E-11	1.459E-11	1.045E-11	7.849E-12	6.103E-12	4.875E-12	3.979E-12
WNW	3.536E-10	1.571E-10	9.516E-11	4.810E-11	2.911E-11	1.952E-11	1.399E-11	1.050E-11	8.166E-12	6.523E-12	5.324E-12
NW	5.736E-10	2.548E-10	1.543E-10	7.802E-11	4.722E-11	3.166E-11	2.269E-11	1.703E-11	1.324E-11	1.058E-11	8.636E-12
NNW	5.845E-10	2.596E-10	1.573E-10	7.950E-11	4.811E-11	3.226E-11	2.312E-11	1.736E-11	1.350E-11	1.078E-11	8.799E-12
N	5.345E-10	2.374E-10	1.438E-10	7.270E-11	4.400E-11	2.950E-11	2.114E-11	1.587E-11	1.234E-11	9.859E-12	8.047E-12
NNE	2.053E-10	9.118E-11	5.524E-11	2.792E-11	1.690E-11	1.133E-11	8.118E-12	6.096E-12	4.740E-12	3.786E-12	3.090E-12
NE	8.623E-11	3.830E-11	2.320E-11	1.173E-11	7.098E-12	4.759E-12	3.410E-12	2.561E-12	1.991E-12	1.590E-12	1.298E-12
ENE	3.611E-11	1.604E-11	9.716E-12	4.911E-12	2.972E-12	1.993E-12	1.428E-12	1.072E-12	8.337E-13	6.660E-13	5.436E-13
E	4.501E-11	1.999E-11	1.211E-11	6.122E-12	3.705E-12	2.484E-12	1.780E-12	1.337E-12	1.039E-12	8.302E-13	6.776E-13
ESE	7.897E-11	3.508E-11	2.125E-11	1.074E-11	6.501E-12	4.359E-12	3.123E-12	2.345E-12	1.824E-12	1.457E-12	1.189E-12
SE	1.268E-10	5.632E-11	3.412E-11	1.724E-11	1.044E-11	6.998E-12	5.014E-12	3.765E-12	2.928E-12	2.339E-12	1.909E-12
SSE	2.234E-10	9.924E-11	6.012E-11	3.039E-11	1.839E-11	1.233E-11	8.835E-12	6.634E-12	5.158E-12	4.121E-12	3.363E-12

USNRC COMPUTER CODE - XOQDOQ, VERSION 2.0 RUN DATE:
XOQDOQ - STP (1997, 1999, 2000 Met Data)

Table 2.7-16 XOQDOQ-Predicted Annual Average D/Q Values at the Standard Radial Distances and Distance-Segment Boundaries (Continued)

D/Q at Various Segments

REALEASE POINT - GROUND LEVEL - NO INTERMITTENT RELEASES
********** RELATIVE DEPOSITION PER UNIT AREA (M**-2) BY DOWNWIND SECTORS **********

SEGMENT BOUNDARIES IN MILES

DIRECTION FROM SITE	.5-1	1-2	2-3	3-4	4-5	5-10	10-20	20-30	30-40	40-50
S	2.773E-08	5.681E-09	1.483E-09	6.661E-10	3.768E-10	1.449E-10	4.192E-11	1.661E-11	8.872E-12	5.491E-12
SSW	2.767E-08	5.668E-09	1.480E-09	6.646E-10	3.760E-10	1.446E-10	4.183E-11	1.658E-11	8.852E-12	5.479E-12
SW	2.453E-08	5.025E-09	1.312E-09	5.892E-10	3.333E-10	1.282E-10	3.708E-11	1.470E-11	7.848E-12	4.858E-12
WSW	2.129E-08	4.360E-09	1.138E-09	5.112E-10	2.892E-10	1.112E-10	3.218E-11	1.275E-11	6.810E-12	4.215E-12
W	2.478E-08	5.076E-09	1.325E-09	5.951E-10	3.367E-10	1.295E-10	3.746E-11	1.485E-11	7.928E-12	4.907E-12
WNW	3.316E-08	6.792E-09	1.773E-09	7.964E-10	4.505E-10	1.732E-10	5.012E-11	1.986E-11	1.061E-11	6.566E-12
NW	5.378E-08	1.102E-08	2.876E-09	1.292E-09	7.307E-10	2.810E-10	8.129E-11	3.222E-11	1.721E-11	1.065E-11
NNW	5.480E-08	1.123E-08	2.930E-09	1.316E-09	7.446E-10	2.863E-10	8.283E-11	3.283E-11	1.753E-11	1.085E-11
N	5.012E-08	1.027E-08	2.680E-09	1.204E-09	6.809E-10	2.619E-10	7.575E-11	3.002E-11	1.603E-11	9.924E-12
NNE	1.925E-08	3.942E-09	1.029E-09	4.622E-10	2.615E-10	1.006E-10	2.909E-11	1.153E-11	6.157E-12	3.811E-12
NE	8.085E-09	1.656E-09	4.323E-10	1.942E-10	1.098E-10	4.224E-11	1.222E-11	4.843E-12	2.586E-12	1.601E-12
ENE	3.386E-09	6.935E-10	1.810E-10	8.131E-11	4.600E-11	1.769E-11	5.117E-12	2.028E-12	1.083E-12	6.704E-13
E	4.220E-09	8.645E-10	2.257E-10	1.014E-10	5.734E-11	2.205E-11	6.379E-12	2.528E-12	1.350E-12	8.357E-13
ESE	7.405E-09	1.517E-09	3.960E-10	1.778E-10	1.006E-10	3.869E-11	1.119E-11	4.436E-12	2.369E-12	1.466E-12
SE	1.189E-08	2.435E-09	6.357E-10	2.855E-10	1.615E-10	6.211E-11	1.797E-11	7.122E-12	3.803E-12	2.354E-12
SSE	2.095E-08	4.291E-09	1.120E-09	5.031E-10	2.846E-10	1.094E-10	3.166E-11	1.255E-11	6.701E-12	4.148E-12

VENT AND BUILDING PARAMETERS:

RELEASE HEIGHT	(METERS)	.00	REP. WIND HEIGHT	(METERS)	10.0
DIAMETER	(METERS)	.00	BUILDING HEIGHT	(METERS)	37.7
EXIT VELOCITY	(METERS)	.00	BLDG.MIN.CRS.SEC.AREA	(SQ.METERS)	2134.0
			HEAT EMISSION RATE	(CAL/SEC)	.0

Question 2.7-5

QUESTION:

Interpret the word "may" as it relates to actions to mitigate potential impacts of construction on air quality.

Full Text (Supporting Information):

The word "may" appears frequently in ER Sections 3.9S.1 et seq. relative to measures that could be used to mitigate impacts of construction on air quality. Clarify how the staff is to value measures that "may"? be implemented. Is there a commitment to take some or all of the measures? Is there sufficient likelihood that some or all of the measures would be taken to allow the staff to give credit for the actions? Who determines whether the measures will be taken? What are the bases for the determination and when would this determination be made?

RESPONSE:

STP will implement some or all of the measures (as appropriate) for the specific conditions which will evolve or change through the detailed design process. The measures are determined during the permitting process by the applicable permitting authority (Federal, State, County, and Local) and STP at the time STP submits the permit application which would include additional detailed design information necessary to supplement the conceptual design. The basis for determination is the limits identified in the permits at the time of issue of the permits. STP environmental management would apply the best management practices and appropriate measures based on the limits during the development of the Construction Environmental Control Plan. The Construction Environmental Control Plan will incorporate the permit limits and requirements (Federal, State, County, and Local) and appropriate mitigation measures necessary for compliance.

CANDIDATE COLA REVISION:

The following changes will be made to Sections 3.9S.1 and 3.9S.2 of the ER as a result of this response.

4.3.1 Replace the first paragraph in 3.9S.1.1 up through and including the first "bullet" with:

The Construction Environmental Control Plan contains descriptions of the environmental management controls that will ~~may~~ be used at the STP site to assist in meeting the overall environmental management objectives for the project.

The processes for achieving these objectives include:

- Summary Matrix of Environmental and Permit Requirements for Construction

A summary matrix of environmental requirements for construction will be prepared for the relevant construction phase environmental requirements. The summary will ~~may~~ include a listing of the specific permit requirements for STP 3 & 4, the titles of the individuals responsible for ensuring compliance with each requirement, and the calendar or scheduled activity start dates by which compliance with each requirement must be completed and the current status of each action item. Section 1.2 generally describes the permits required for construction.

4.3.2 Modify Section 3.9S.2 through 3.9S.2.1 as follows:

4.3.3 3.9S.2 Environmental Procedures

Although current STP site environmental procedures address regulatory and permit requirements, additional permit requirements, including those of air quality, will as appropriate ~~may~~ be incorporated that address specific measures for mitigation of environmental impacts during the construction phase. Various types of environmental procedures for the construction of STP 3 & 4 are discussed in the following paragraphs.

4.3.3.1.1 3.9S.2.1 Noise and Vibration

4.3.3.1.2

Procedures related to mitigating noise and vibration impacts from construction activities will ~~may~~ include measures such as restricting noise and vibration generating activities to daylight hours, prohibiting construction activities from specific roads and neighborhoods, use of less vibration producing equipment and/or methods (e.g., dampeners, staggering activities), and verifying that noise control equipment on vehicles and equipment is in proper working order. Notifications to regulatory agencies and nearby residents regarding atypical noise and vibration events (e.g., pile driving, steam/air blows) will as appropriate ~~may~~ also be performed.

4.3.3.2 Modify 3.9S.2.3 as follows:

4.3.3.3 3.9S.2.3 Erosion and Sedimentation Control

Erosion and sedimentation control procedures will describe the measures to be taken during the course of construction. These measures will cover temporary and permanent measures and all relevant detailed engineering drawings illustrating the permanent plant design. Depending on conditions and permit requirements for construction of STP 3 & 4, the information will ~~may~~ include:

- Clearing limits and maintenance of existing vegetative cover
- Site grading
- Topsoil stripping and stockpiling

- Temporary erosion controls (e.g., silt fencing, mulching, erosion control blankets, temporary seeding)
- Permanent erosion controls (e.g., reestablishing natural drainage patterns, vegetated swales, permanent seeding/plantings)
- Check dams, rip-rap, retention/detention basins, and sediment barriers
- Slope restoration and protection
- Roads and equipment crossings
- Maintaining drainage patterns

4.3.3.4 Modify Section 3.9S.2.5 as follows:

4.3.3.5 3.9S.2.5 Protection of Sensitive Resources

Procedures will be established to describe the mitigation measures for environmentally sensitive resources either within the STP site or in the immediate surrounding areas that have the potential to be adversely impacted during construction. These areas have been identified during preconstruction surveys of the site area as part of the overall development and permitting effort. Mitigation measures, if any required will be addressed under the STP 3 & 4 permits as discussed in Section 1.2.
The following lists some environmentally sensitive resources that could ~~may~~ be encountered during construction activities at the STP site, along with the typical mitigation measures required to eliminate and/or minimize impacts on the resources.

- Wetlands : Primary mitigation measure is avoidance, based on preconstruction surveys and installation of exclusion fencing. Some activities could ~~may~~ require temporary impacts to wetlands. These impacts will be mitigated by following permit conditions that will as appropriate include:

  - Reduced clearing limits and preservation of existing vegetative cover
  - Maintenance of existing drainage patterns
  - Prohibitions/restrictions on equipment and vehicular travel
  - Prohibition of maintenance/refueling near wetland boundaries

  The requirements for restoring disturbed areas would also be addressed.
- Rivers and streams: Primary mitigation measure is avoidance through installation of exclusion fencing. Mitigation measures for direct impacts to waterways (e.g., crossing of a pipeline, constructing an access road, installing discharge pipe) could ~~may~~ be spelled out in permits. Mitigation measures will as appropriate ~~may~~ include the following:

  - Limits on the length of time of the disturbance
  - Seasonal limits and restrictions for in-water work
  - Reduced clearing limits and preservation of existing vegetative cover near the stream banks

- Installing only specified crossings (e.g., mat bridges)
- Using silt curtains and other sediment transport barriers
- Restrictions on fill activities and materials
- Restoring stream beds, banks, and natural vegetation

- Areas of special status wildlife habitats or vegetation — Primary mitigation measure is avoidance, based on preconstruction surveys, establishment of buffer zones, and installation of exclusion fencing. In rare instances, construction activities could inadvertently encounter special status wildlife species, their habitat, or vegetation, in which case work in the immediate area would be halted and appropriate state agency officials and/or environmental consultants would be contacted to determine proper mitigation measures that would as appropriate be implemented so that work may resume.

- Archeological /cultural resource areas-Primary mitigation measure is avoidance based on preconstruction surveys, establishment of buffer zones, and installation of exclusion fencing. In rare instances, construction activities could inadvertently encounter buried archeological/cultural resources in which case work in the immediate area would be halted and archeological experts 9such as representative from the State Historical Preservation Office) would be contacted to determine proper mitigation measures that will be implemented, so that work may resume.

4.3.3.6 Modify Section 3.9S.2.6 as follows:

4.3.3.7 3.9S.2.6 Unanticipated Discoveries

Procedures addressing unanticipated discoveries would be developed to describe the process to be followed in the event such discoveries are made during construction. The procedures will address on and offsite notifications. Unanticipated discoveries could include:

- Contaminated or suspect soils and groundwater
- Drums and tanks
- Building foundations
- Cultural artifacts
- Bones

In the event this occurs, construction will be required to immediately stop work in the area of the unanticipated discovery and to immediately report the situation. For unanticipated discoveries that could be immediately hazardous to human health, the site safety representative would also be immediately notified. Additional investigations, sampling, analysis, and notifications to appropriate agencies will ~~may~~ be made as appropriate.

Question 4.2-1

QUESTION:

Describe water resources that may be impacted along the transmission line.

Full Text (Supporting Information):

Describe water resources that may be impacted along the transmission line due to required modifications to the transmission line.

RESPONSE:

As discussed in ER Section 2.2, the approximately 20 mile from STP to the Hillje substation is the only transmission line route where offsite modification may be required. Major land uses are discussed in ER Section 2.2.

Near the STP site, this transmission line crosses irrigation canals, unnamed drainage features, and an unnamed pond. As the line continues to the northwest the line crosses additional irrigation canals until it crosses the first named water body, Wilson Creek south of the Missouri Pacific railroad and west of the Port of Bay City. The transmission line continues to the northwest crossing the Missouri Pacific railroad and additional unnamed drainage features/canals until it crosses the Tres Palacios River just south of the Southern Pacific railroad. The transmission line parallels Juanita Creek as it trends to the northwest and crosses the creek near the Matagorda/Wharton County line. The transmission line in this area passes very close to and unnamed pond and continues to the Hillje substation.

As discussed in ER Section 3.7, regulations of the Public Utility Commission of Texas require the transmission service provider to implement measures to mitigate the adverse impacts of construction of any new transmission lines and modification of existing electric transmission lines. Required mitigation measures are adapted to the specifics of each project and may include such requirements as: (A) selective clearing of the right-of-way to minimize the amount of flora and fauna disturbed; (B) implementation of erosion control measures; (C) reclamation of construction sites with native species of grasses, forbs, and shrubs; and (D) returning the site to its original contours and grades.

CANDIDATE COLA REVISION:

No COLA revision is required as a result of this response.

Question 4.2-2

QUESTION:

Describe construction-related water quality impacts to hydrologic features.

Full Text (Supporting Information):

Describe construction-related impacts to hydrologic features on or near the site, including any drainage pattern changes due to placement structures and drainage ditches for Units 3 and 4. Provide a map showing the location of these hydrologic features on the site. Describe construction-related water quality impacts to the unnamed onsite drainage, Texas Prairie Wetland, Little Robbins Slough, and Kelly Lake.

RESPONSE:

Texas Prairie Wetland

Wetland features are indicated on Figure 2.4-3 and major water bodies are indicated on Figure 2.4-2. The Texas Prairie Wetland, referred to in Sections 4.2 and 2.4, is located near the current entrance to the STP site, north and east of the proposed STP 3 & 4 locations and would not be impacted by the proposed construction activities. There are currently no activities planned in the vicinity of the Texas Prairie Wetland and, therefore, no anticipated impact to this area.

Site ditch system and Little Robbins Slough

The current STP site ditch system is presented on Figure 2.4-3. The final proposed location of any new STP Site drainage that would need to be constructed or relocated has yet to be determined. After a construction contractor has been selected, STPNOC and the contractor will determine what existing drainage features may need relocation or modification to control runoff from the proposed facilities. The section of ditch currently located in the proposed area of Units 3 & 4 will have to be relocated north of the proposed STP 3 & 4 site. The new ditch will flow to Little Robbins Slough. The area in the vicinity of the new construction would be contoured to facilitate the flow of surface water away from the proposed operating units and support facilities to the relocated ditch system. The old ditches and surface swales in the area of proposed construction would be filled or contoured as needed to facilitate surface flow toward site drainages. Impacts that could be associated with the proposed construction activities include the potential for silt entering Little Robbins Slough during the excavation or placement of surface and subsurface materials. The Construction Storm Water Pollution Prevention Plan and a Storm Water Management Plan developed by STP and the selected construction contractor would specify erosion control measures in accordance with Best Management Practices (BMPs) that would include silt barriers and/or the use of retention ponds. During construction activities, the groundwater pumped during dewatering activities would require disposal. Water pumped from construction excavations during dewatering activities would be pumped to the MCR for use.

The water could also be discharged to a retention pond where the silt would settle prior to allowing the water to discharge out of a retention pond(s) to site drainage swales and the site ditch system. If water from dewatering activities were discharged in this manner, the flow in Little Robbins Slough could increase substantially during this phase of construction, potentially impacting terrestrial and aquatic communities along the stream and banks of the drainage features by raising the water level within the stream. In the unlikely event that water is discharged to Little Robbins Slough, flow rates will be monitored and controlled. Impact to these features are expected to be SMALL and not warrant mitigation other than previously discussed.

Releases of pollutants from construction activities and equipment operation and maintenance could also impact water quality of site surface water. Because of limited connection between the groundwater and surface water at the site (ER Sections 2.3.1 and 2.3.2), the discharge of shallow groundwater to the site surface water features could also impact water quality within the receiving waters. However, a TPDES permit would be required and sought by STP and any discharge to surface water bodies would be in accordance with the State of Texas permit requirements. Chemical releases to the environment could be limited through the use of a Spill Prevention Control and Countermeasure Plan developed by STP, which would include using designated areas to fuel and perform maintenance on equipment and vehicles. Therefore, impacts to site ditches and drainage areas would be **SMALL** and mitigation other than those discussed would not be warranted. A portion of the water pumped to the MCR could be diverted to site drainage features during potential periods of drought to maintain flow in site drainage where a decrease in flow could impair terrestrial and aquatic communities. This would result in a positive impact to the STP site environment and areas adjacent to the site. Flow in these features, as discussed above, would require monitoring to determine whether adequate flow was occurring or whether flow was insufficient to maintain adequate flow for the effective environment.

Kelly Lake

Kelly Lake is located along the northeastern portion of the MCR. Even though the lake is not located within the areas of proposed construction activity, the lake could be impacted through the surface water runoff transport of silt and construction related chemical spills (potential chemicals from surface spills during construction or from vehicles in the vicinity) (ER Sections 2.3.1 and 4.2). The use of erosion control devices would help to limit the potential for impacts to occur. Also, limiting fueling and maintenance of vehicles to specified areas (as discussed above) would limit potential chemical impact to the surface water body. Therefore, impacts to Kelly Lake would be **SMALL** and mitigation other than those discussed would not be warranted.

CANDIDATE COLA REVISION:

No COLA revision is required as a result of this response.

Question 4.2-3

QUESTION:

Provide information regarding the Erosion and Sediment Control Plan and Storm Water Management Plan.

Full Text (Supporting Information):

Provide the STP 3 & 4 Erosion and Sediment Control and Storm Water Management Plans. If finalized plans are not available, provide statements regarding the objectives of each plan and an explanation of how the objectives will be met. Provide the projected date the final plans will be available.

RESPONSE:

The STP 3 & 4 Storm Water Pollution Prevention Plan (SWPPP) for the proposed activity is not yet available but would be similar to the Industrial SWPPP for Units 1 & 2. The SWPPP will be available after the selection of a construction contractor. The intent of the SWPPP, as developed under Section 402 of the Clean Water Act and Section 26 of the Texas Water Code, is to ensure that potential pollution sources at the site, including erosion and sedimentation, are thoroughly evaluated and that appropriate measures designed to prevent or control the discharge of pollutants in storm water runoff are selected and implemented. The development and implementation of the plan involves the following steps: (1) formation of a team of qualified plant and contractor personnel who would be responsible for assisting in its implementation, (2) assessment of potential storm water pollution sources, (3) selection and implementation of appropriate management practices and controls, and (4) periodic evaluation of the ability of the plan to prevent storm water pollution and comply with the terms and conditions of the multi-construction general storm water permit.

The construction phase SWPPP would be developed to utilize existing conveyances, ditches, and drainage schemes along with applications of best available technologies (BATs) current at the time the plan is prepared. The BATs would include, where appropriate, such items as silt fencing, straw bales, French drains, and any other technologies deemed appropriate and approved by the Texas Commission on Environmental Quality (TCEQ).

CANDIDATE COLA REVISION:

No COLA revision is required as a result of this response.

Question 4.2-4

QUESTION:

Describe the impacts of new pump installation activities.

Full Text (Supporting Information):

Describe the impacts, including water quality impacts, of new pump installation activity on the RMPF, the intake area, and the Colorado River.

RESPONSE:

There would be no new construction activities needed at the Reservoir Makeup Pumping Facility (RMPF) or the intake area. Makeup water intake pipes and pumps for the Main Cooling Reservoir (MCR) were installed during the construction of STP 1 & 2. Following the initial filling of the MCR, half of the pumps installed were removed or used for replacement parts for the pumps remaining in place. The remaining pumps have been sufficient for MCR makeup. To ensure sufficient pumping capacity for four unit operation of the MCR, STPNOC will reinstall the pumps previously removed. The traveling screens, should they need to be repaired or replaced would be removed by unbolting and lifting them out. The replacement pumps can be put in place without new construction activities being performed. Therefore, there would be no new construction activity impacts to the Colorado River during replacement pump installation or traveling screen replacement, if required.

Should dredging be required within the RMPF in the vicinity of the actual cooling water intake forebay or along the river at the traveling screens, the impacts would be SMALL and consist of increased turbidity for a relatively short period of time. All dredging would be accomplished under an existing STPNOC dredging permit. The dredged material would be pumped to the STP site's dredge spoil area located near the RMPF for disposal in accordance with the terms and conditions of the permit.

CANDIDATE COLA REVISION:

No COLA revision is required as a result of this response.

Question 4.2-5

QUESTION:

Provide information regarding the locations of drainage ditches and retention ponds.

Full Text (Supporting Information):

Provide information regarding the locations of drainage ditches and retention ponds. If the information is not currently available, then when, prior to the completion of the NRC staff's review, will the locations of drainage ditches and retention ponds be determined?

RESPONSE:

The final proposed location of any new STP Site drainage ditches or retention ponds for Unit 3 & 4 construction and operation activities that would be constructed or relocated has yet to be determined. After a construction contractor has been selected, STPNOC and the contractor will determine what existing drainage features may need relocation or modified to accept runoff from the proposed facilities and would also evaluate the need for retention ponds and would at that time determine the best location for these facilities.

The section of ditch currently located in the proposed area of Units 3 & 4 will have to be relocated north of the proposed STP 3 & 4 site. New ditches proposed to drain the new operations area would probably be reconnected to the relocated segment of Little Robbins Slough. The area in the vicinity of the new construction would be contoured to facilitate the flow of surface water away from the area of the proposed operating units and support facilities to the relocated ditch system. The old ditches and surface swales in the area of proposed construction would be filled or contoured as needed to facilitate surface flow toward site drainages.

CANDIDATE COLA REVISION:

No COLA revision is required as a result of this response.

Question 4.2-7

QUESTION:

Provide a list and description of pre-construction activities mentioned in ER Section 1.1.2.7.

Full Text (Supporting Information):

Provide a list and description of pre-construction activities mentioned in ER Section 1.1.2.7.

RESPONSE:

As indicated in ER Section 3.9s.1, the following preconstruction activities include:

Preconstruction Activities:

- Installation and Establishment of Environmental Controls
- Road and Rail Construction
- Security Construction
- Temporary Utilities
- Temporary Construction Facilities
- Lay-down, Fabrication, Shop Area Preparation
- Clearing, Grubbing, and Grading
- Underground Installations
- Unloading Facilities Installation
- Intake/Discharge Coffer Dams and Piling Installation
- Power Block Earthwork (Excavation)
- Module Assembly

Road and Rail Construction

Construction access to the STP site will be via a paved road, Farm-to-Market (FM) 521. The construction traffic will minimize disruption of existing traffic patterns by entering the site from the north where FM 1468 meets FM 521, or via the west entrance to the plant property from FM 521. The existing STP 1 & 2 traffic will continue to enter from the east entrance off FM 521. To the extent practical, STPNOC will use the existing site road system and drainage systems installed during construction of STP 1 & 2 which are still in use. The existing drainage ditch that runs east and west through the STP 3 & 4 footprint, north of the existing switchyard, will be relocated to accommodate the new units. The new switchyard for STP 3 & 4 will be located north of the newly relocated drainage ditch, and a road system into the switchyard will be built. A heavy haul route approximately 2-1/2 miles long will be built on site to support the transport of heavy modules and components from the existing heavy haul route from the barge slip.

Adequate temporary traffic surfacing will be installed, as needed, as part of the heavy haul route. A tie-in to the existing haul route near the Security Department firing range will be constructed and the new section of heavy haul route will run north and east around the existing essential cooling pond, under the high-voltage transmission lines, then south into the STP 3 & 4 power block to the construction laydown and fabrication areas. Temporary construction parking lot, construction laydown and fabrication areas will be cleared, grubbed, graded, and graveled or paved with a road system to accommodate the site construction traffic. The existing rail line on site will be upgraded and the route to Buckeye, Texas will be reestablished. The upgrades will include the installation of new ballast or rail sections on the existing rail bed. Figure 3.9S-1 depicts the construction utilization plan, along with plant access roads, heavy haul roads, and other construction planning features.

Security Construction

Security features will be installed during the early part of site preparation activities. Security structures will include access control points, fencing, lighting, physical barriers, and guardhouses.

Temporary Utilities

Temporary utilities will include aboveground and underground infrastructure for power, communications, potable water, wastewater and waste treatment facilities, fire protection, and for construction gas and air systems. The temporary utilities will support the entire construction site and associated activities, including construction offices, warehouses, storage and laydown areas, fabrication and maintenance shops, the power block, the batch plant facility, measuring and testing equipment, and intake/discharge areas.

Temporary Construction Facilities

Temporary construction facilities, including offices, warehouses (for receiving and storage), temporary workshops, sanitary toilets, change, training, and personnel access facilities (i.e., locker rooms) will be constructed. The site of the concrete batch plant will be prepared for aggregate unloading and storage, and the cement storage silos and the concrete batch plant will be erected.

Laydown, Fabrication, Shop Area Preparation

Activities to support preparation of the laydown, fabrication, and shop areas include: Performing construction survey to establish local coordinates and benchmarks for horizontal and vertical control; grading, stabilizing, and gravel laydown areas; installing construction fencing; installing shop and fabrication areas including the concrete slabs for formwork laydown, module assembly, equipment parking and maintenance, fuel and lubricant storage, and rigging loft; installing concrete pads for cranes and crane assembly.

Clearing, Grubbing, and Grading

Temporary spoils, borrow, and topsoil storage areas will be established on the southwest parts of the STP site property (Figure 3.9S-1). Clearing and grubbing of the site will begin with the removal of vegetation. Topsoil will be moved to a storage area (for later use) in preparation for excavation. The general plant area, including the switchyard and Ultimate Heat Sink (UHS) areas will be brought to plant grade (approximate elevation of 30 feet above mean sea level) in preparation for foundation excavation. Existing buried utilities in the site area will be removed. The site utilization plan illustrates the areas to be cleared and graded.

Underground Installations

Non-safety-related underground fire protection, water supply piping, sanitary system, compressed air and gas piping, and electrical power and lighting duct bank will be installed and backfilled.

Unloading Facilities Installation

The existing rail line will be upgraded with adjacent construction laydown areas to support receipt of the bulk commodities. A spur into the batch plant area to support concrete materials unloading may also be installed during the upgrade. Concurrently, any crane foundations will be placed, and a heavy lift crane will be erected.

The existing barge slip will also require upgrades to accommodate roll-on and roll-off module receipt. Dredging of the river and slip area may also be required. Dredging of the barge slip and Colorado River will be coordinated with the U.S. Army Corps of Engineers under the existing permit (Section 1.2), and dredge material will be deposited in existing dredge fill areas adjacent to the barge slip.

Intake/Discharge Coffer Dams and Piling Installation

A permanent sheet pile cofferdam system will be installed on the east and west side of the intake/discharge main cooling reservoir north separation dike for the new circulating water intake structure and associated piping. A temporary cofferdam will also be driven on the interior of the main cooling reservoir embankment to facilitate the installation of the discharge structure. Excavation and dredging of the intake structure, pump house erection, and the installation of mechanical, piping, and electrical systems will follow the sheet pile installation, bracing system, and dewatering, and will continue through site preparation into plant construction. Excavated and dredged material will be transported to an onsite spoils area located outside the boundaries of designated wetlands in the southwest portion of the plant property.

Power Block Earthwork (Excavation)

The power block consists of an area footprint encompassing the Nuclear and Turbine Island Building areas, which include the following buildings for each unit:

- Reactor Building
- Control Building
- Radwaste Building
- Service Building
- Turbine Building

The mass excavation of the power block areas will occur in two stages (STP 3 followed by STP 4) as part of site preparation activities for STP 3 &4. The deepest excavations in the power block area are for the Reactor Buildings, approximately 95 feet below site grade. The Reactor Building will be over-excavated 10 feet deeper and 10 feet wider than the underside of foundation and replaced with structural fill. The next deepest excavations are for the Control Buildings at 77 feet below site grade. The Control Building will be over-excavated 2 feet and replaced with structural fill below the underside of foundation. The Radwaste Building will be excavated approximately 69 feet below site grade. The Radwaste Building will be overexcavated 15 feet deeper and 10 feet wider than the underside of foundation and replaced with structural fill. The Turbine Building excavation is approximately 34 feet below grade with 2 feet of over-excavation replaced with concrete fill. The circulating water piping excavation areas are approximately 41 feet below grade. The UHS Basin and pump house areas are a stepped excavation down to 43 feet at the deepest point. The Service Building is a stepped excavation down to 48 feet at the deepest point. Other yard building and tank foundation excavations are relatively shallow (less than 6 feet).

An extensive well point dewatering system will be installed around the STP 3 & 4 excavation boundary before the mass excavation begins. The dewatering system is intended to route the extracted well water to the main cooling reservoir in compliance with the Construction Environmental Plan. During the excavation, slope protection and retaining wall systems will be installed. Ditches and/or dikes will be constructed around the excavation areas to prevent surface water/runoff from entering the work area. Drainage sumps and/or well points will be installed at the bottom of the excavations from which surface drainage and/or accumulated groundwater will be pumped to a storm water discharge point that will route the water to collection delay basins to filter out turbidity and solids. Excavated material will be transferred to the spoils and backfill borrow storage areas. Acceptable material from the excavation will be stored and reused as structural backfill.

In accordance with Regulatory Guide 1.165 (Reference 3.9S-1), the open excavations will be geologically mapped and the NRC will be notified when the excavations are open for inspection.

Module Assembly

The ABWR design requires a high degree of modularization. The steel module components in the nuclear island will be fabricated offsite, shipped to the site via rail, truck, or barge and will be assembled into complete modules prior to setting in the power block. The module component rail shipments will arrive in sections with dimensions up to 12 feet (H) x 12 feet (W) x 80 feet (L), weighing up to 80 tons. Shipment by truck over the road would arrive in sizes up to 8 feet (H) x

8 feet (W) x 40 feet (L), weighing up to 20 tons. Modules weighing up to 1000 tons will arrive by barge, be transported to the power block area, and offloaded in fabrication assembly areas. The assembly of the component panels into complete modules on site will begin during the site preparation phase. The Reactor Building base mat reinforcing module will be the first module assembled during site preparation. The setting of completed containment liner modules will occur upon receipt of the COL. The completion of early module assembly is planned to coincide with the completion of STP 3 Reactor Building base mat foundation.

CANDIDATE COLA REVISION:

No COLA revision is required as a result of this response.

Question 4.2-8

QUESTION:

Provide a map or drawing showing the extent of the excavations, and how close they will come to STP 1 & 2, the MCR, and wetlands. Describe the dewatering and excavation process.

Full Text (Supporting Information):

The excavation for each unit (900' x 950') and for each ultimate heat sink (650' x 550') are provided; however, whether these areas overlap and could create a larger excavation is not discussed. Provide a map or drawing showing the extent of the excavations, and how close in proximity they will be to STP 1 & 2, the MCR, and wetlands. Describe the dewatering and excavation process and duration, or the options that STP is evaluating [e.g., will an initial dewatering depth involve an area encompassing the footprint of both reactors and continue for an extended period of time, (i.e., 4 years or longer); would the deepest dewatering efforts be local to the reactor facilities and short term, (i.e., 1 year)]

RESPONSE:

The information provided above and in ER Section 4.2 is what is currently available. ER Figures 2.4-1 and 2.4-3 indicate the proposed Unit 3 & 4 locations in relation to the Main Cooling Reservoir (MCR), Units 1 & 2, and site wetlands. NRC is correct that the ER does not indicate whether the excavations would overlap into a larger excavation. This could occur if the excavation for each powerblock occurred at the same time. The dewatering analysis assumed a single excavation for the two units (1200 feet by 650 feet). Estimates for the actual size of the excavation have yet to be determined.

The experience in construction of Units 1 & 2 may be indicative. The excavation for Units 1 & 2 was cut and fill. The dewatering systems consisted of a combination of perimeter dewatering and open pumping from sumps within the excavation. The perimeter dewatering wells controlled lateral flow and assisted in removing water stored within the excavation. The open pumping system controlled precipitation run-off and assisted in water storage removal. Local dewatering wells were installed to dewater the deeper portion of the excavation for the reactors.

Excavation dewatering began for Units 1 & 2 in 1975. Deep local dewatering systems were terminated in November 1976 (Unit 1) and February 1978 (Unit 2). The pumping of the perimeter dewatering system was gradually reduced starting in 1978. Dewatering of the power blocks began in November 1984. In January 1987 all dewatering was discontinued. Groundwater does seep into some below ground structures requiring sump pumps and other control methods.

Once a construction contractor has been decided upon, a Dewatering Plan will be developed that will describe the dewatering activities, estimate the size of the proposed excavation(s), and the length of time required for dewatering.

CANDIDATE COLA REVISION:

No COLA revision is required as a result of this response.

Question 4.2-9

QUESTION:

Why is the lower value of subsidence estimates used?

Full Text (Supporting Information):

A range of subsidence estimates are provided in Table 4.2-1, however, the discussion thereafter focuses on the lower and not the highest value; provide the rationale for using the lower, rather than the bounding value. Could the upper estimate of subsidence be tolerated by the MCR, or would mitigation measures be required? What level of subsidence would indicate that an alternate approach to dewatering (e.g., perhaps involving cutoff walls, injection wells, infiltration trenches) is needed? If a decision has not been made regarding the dewatering method to be employed, then describe the alternatives being evaluated (e.g., discharge to MCR, use of discharge to mitigate wetland impacts, onsite drainage ditches, injection wells) and the potential impacts of each. Describe how dewatering is related to the Storm Water Pollution Prevention Plan that is being developed, (i.e., where will the dewatering product be discharged?). Discuss subsidence (i.e., its cause, the magnitude of its impact, etc.) as it relates to environmental impacts (e.g., the storm water management plan, where MCR relief well discharge will be routed).

RESPONSE:

Subsidence could be an environmental issue for Section 4.2 if it pertains if it results from the potential compaction of an aquifer or results in a change in the surface elevation that could alter the surface water flow direction. STP currently has not developed a Dewatering Plan. Once STP decides upon a construction contractor, the contractor and STP will develop a Dewatering Plan for the proposed construction activities. The groundwater level in the vicinity of the excavation would be monitored to determine whether the shallow portion of the aquifer being dewatered would be affected by the compaction of aquifer formational material resulting in subsidence of the affected area. If it is determined that significant compaction of the aquifer resulting in subsidence could occur as the result of dewatering activities, an evaluation of the potential impact could be performed and potential mitigation activities, such as cutoff walls, put in place.

However, as indicated below and in ER Section 4.2, the potential subsidence is estimated to be approximately 0.01 to 0.08 feet or 0.1 to 1 inch. A resulting compaction and subsidence of approximately 1 inch localized to the vicinity of dewatering would result in little to no offsite impact to groundwater flow. The impacts resulting from compaction of approximately 1 inch of the aquifer formation material would occur on site local to the excavation. Therefore STPNOC has determined potential impacts to be SMALL and not alter the overall surface drainage flow patterns in the vicinity of the dewatering activities.
STPNOC determined the lower range of the subsidence estimate to more clearly represent what could occur based on hydraulic evaluations performed as a preliminary evaluation for the proposed project and on observed field conditions during the construction dewatering performed for Units 1 & 2.

As discussed in ER Section 4.2, a steady-state dewatering flow rate during the construction of STP 3 & 4 is estimated to be between 1800 and 4200 gallons per minute (gpm). The hydraulic conductivity in the upper unit of the shallow portion of the Chicot Aquifer is between 65 and 420 gallons per day/square foot (gpd/ft2). Transmissivity values range from 1100 and 10,500 gallons per day per ft (gpd/ft). The storage coefficient varies between 0.0017 and 0.0007. The lower unit of the shallow portion of the Chicot Aquifer has a hydraulic conductivity that ranges between 410 and 600 gpd/ft2, a transmissivity range between 13,000 and 33,000 gpd/ft, and storage coefficients between 0.00045 and 0.00071.

The estimated range of drawdown and subsidence at key facility structures based on initial estimates are included in ER Table 4.2-1. The excavation dewatering rates measured during STP1 & 2 construction (1300 gpm to 2900 gpm) indicate the estimated STP 3 & 4 rates would be less than the upper bounded steady-state flow of 4200 gpm, which suggests that the drawdown and subsidence estimates based on the lower hydraulic conductivity value may be more realistic. Therefore, the amount of projected drawdown and subsidence at the MCR and STP 1 & 2 would likely be on the lower end of the estimate ranges as shown in ER Table 4.2-1. Should the groundwater drawdown monitoring or actual dewatering pumping rates indicate that subsidence would be greater than anticipated, STPNOC and the construction contractor would evaluate the situation and could use cutoff wall technology to limit potential subsidence impacts.

As discussed in ER Section 2.6.1.1, based on experience with the construction and operation of STP 1 & 2, permanent dewatering during construction and operation will not be required at STP 3 & 4. Even if the removal of groundwater would be protracted over the life of the operation of the plant, the potential for minimal settlement is possible. The potential impacts of subsidence from a safety perspective are discussed in FSAR Subsections 2.5S.1 and 2.5S.4.

Disposal of water options during the dewatering process are discussed in RAI 4.2-2 Response, RAI 4.2-6 Response. The preferred option for water disposal during dewatering activities would be to discharge the water to the MCR. Potential subsidence of the range indicated would not have an impact on the water disposal options being considered for dewatering operations during construction. A Storm Water Pollution Prevention Plan (SWPPP) has yet to be developed, but will be in place during construction related activities. A discussion of the SWPPP is in RAI 4.2-3 Response.

CANDIDATE COLA REVISION:

No COLA revision is required as a result of this response.

Question 4.2-10

QUESTION:

Demonstrate the lack of connectivity between dewatering wells and the wetlands and shallow surface water features.

Full Text (Supporting Information):

Section 4.2.1.2 of the ER states, "The presence of the surficial clays would also isolate wetlands and shallow surface water (natural and man-made drainage) features in the vicinity of STP 3 & 4 from the underlying subsurface soil units being dewatered during construction." Are there long-term pumping data sets available from the construction of STP 1 & 2 that demonstrate the lack of connectivity between dewatering wells and the wetlands and shallow surface water features in the vicinity of proposed Units 3 and 4? Have long-term aquifer tests demonstrated this situation? Will STP develop a monitoring plan that could identify impacts and trigger mitigation measures? If so, describe the objectives and details of the monitoring plan, and describe the possible mitigation measures.

RESPONSE:

The potentiometric water surface in wells in the area was 5 to 10 feet below land surface (bls). There does not appear to be a continued water column that connects the STP site's surface drainage features to the shallow groundwater at the site that would be dewatered. However, as discussed in ER Section 2.3.1.2.3.2, the shallow aquifer sands encountered in the proposed area of construction were at depths of 15 to 30 feet bls.

There is no long term pump test data for the site where surface water bodies were monitored during the test. As part of the Dewatering Plan, to be developed by the dewatering contractor and STPNOC, the groundwater and selected surface features in the vicinity of the dewatering activities could be monitored during dewatering activities to determine if dewatering activities are impacting surface water features nearby.

If dewatering activities were found to be significantly impacting surface water features near the excavation, water from the excavation during the dewatering process could be pumped to the drainage/water feature to supplement flow in the affected surface water feature. Cutoff-wall technology could also be used to limit potential dewatering impacts to the vicinity of the excavation.

CANDIDATE COLA REVISION:

No COLA revision is required as a result of this response.

Question 4.2-11

QUESTION:

Provide a full description of the potential impacts to nearby groundwater users.

Full Text (Supporting Information):

Section 4.2.2 of the ER states that since STP use would not exceed the site's 1860 gpm (3000 acre-ft/yr) existing permit, "the Coastal Plain Groundwater Conservation District (CPGWCD) would be aware of potential impacts to nearby groundwater users." Provide a description of the potential impacts to nearby groundwater users related to full use of the permitted quantity.

RESPONSE:

Section 4.2.2.1 should have stated that the impact associated with groundwater use during construction would be SMALL. The SMALL to MODERATE was an error that was not corrected when the sections were reviewed.

The potential impacts to available groundwater in Matagorda County from the STPNOC use of 3000 acre-feet/year (current permit limit) is discussed in RAI 2.3-12 Response. The impact of pumping at 3000 acre-feet per year (1860 gpm) on groundwater availability in Matagorda County would be SMALL. The permitting of additional production wells within the same aquifer sequence used to supply current site groundwater needs and/or increasing the design capacity of Production well 8 and the NTF Well would allow STP more flexibility in their pumping options during construction while remaining within the current permitted rate of 1860 gpm (3000 acre-feet per year).

As discussed in ER Section 4.2, the Coastal Plain Groundwater Conservation District (CPGCD) set a minimum distance between wells of 2500 feet in an attempt to limit potential interference between wells.

ER Section 2.3.1.2.3.5 discusses water levels in Well 8015301 monitored by the Texas Water Development Board. Water levels from the well generally indicate stable water conditions over the period of record. STP site deep aquifer well 613 is located to the southwest of the proposed STP Units 3 & 4 in the influence area of STP Production Well 6. Well 613 showed a notable increase in water levels between 1996 and 1998 and a slight decline between 2004 and 2006. ER Section 2.3.1 Figure 2.3.1-28 indicates the drop in water level is most likely associated with a period of drought and not associated with pumping operations of STP wells.

As discussed in ER Section 4.2, the assumptions made were that the aquifer is homogeneous, isotropic, of uniform thickness, and of infinite aerial extent. The assumptions also include that the potentiometric surface prior to pumping is horizontal; the well is pumped at a constant discharge rate; the well is fully penetrating and flow is horizontal; the well diameter is infinitesimal so that storage within the well can be neglected; and water from storage is

discharged instantaneously with decline of head. The results of the confined non-leaky scenario model indicated that drawdown of the deeper portion of the Chicot Aquifer potentiometric surface at a distance of 2500 feet from any STP site well based on an average pumping rate of 798 gpm after a period of 27 years (9855 days), which is the operational period of STP 1 & 2 to beginning of construction, would result in a drawdown of 27 to 30 feet. During the construction period [7 years (2555 days)] for STP 3 & 4, the drawdown associated only with the construction activities and a pumping rate of 1062 gpm is 32 to 36 feet. During the period of overlap of the current operational water use and the amount of water projected to be used during construction of STP 3 & 4 over the length of construction activities, the drawdown of the potentiometric surface of the Chicot Aquifer was determined to be 55 to 63 feet (pumping rate of 1860 gpm, which is the current permitted value) at 2,500 feet from the pumping well.

In reality, under the confined non-leaky scenario, the actual withdrawal resulting from the pumping of any STP site well a distance of 2,500 feet away would be similar to the drawdown that could be generated under current operating conditions based on design yields and assuming that, to prevent coalescing drawdowns, the wells pumped are pumped in a manner such that no two adjacent wells are ever pumped at the same time. The drawdown at a distance 2,500 feet from any STP site well for the 500 gpm design yield during the projected 40-year operating period of STP 1 & 2 is 18 to 20 feet.

The water level monitoring results in ER Section 2.3.1 discussed above would indicate that the drawdown to the aquifer is less than the model predicts. And in fact, the data would indicate that the groundwater level in well 613 has been generally stable. Therefore, the impacts from pumping on the wells in the vicinity of the site are SMALL.

CANDIDATE COLA REVISION:

ER Section 4.2, Page 4.2-11, second paragraph will be changed as follows:

STPNOC concludes that impacts due to increased pumping during construction activities to the deeper portion of the Chicot Aquifer would be SMALL ~~to MODERATE~~ and would not warrant mitigation. A reduction in drawdown potential could be obtained by the permitting of additional production wells within the same aquifer sequence that would be used to supply groundwater during construction. This would allow STP to decrease the actual pumping rate at each well location, thereby spreading out the potential drawdown impacts across the STP site and reducing the effect each of the individual wells would have on offsite well locations while pumping within the current permitted rate of 1860 gpm (3000 acre-feet per year).

Question 4.2-12

QUESTION:

Present an evaluation or validation of the model shown at the beginning of Section 4.2.2.1.

Full Text (Supporting Information):

Present an evaluation or validation of the performance of the equation (model) shown at the beginning of Section 4.2.2.1 to predict present day drawdown from the production wells. Given the existing data set, how is the data to be used to validate the model to forecast future drawdown resulting from greater groundwater withdrawals during construction and operation of STP proposed Units 3 and 4?

RESPONSE:

STPNOC assumes that the Nuclear Regulatory Commission's (NRC) intent of this RAI is to determine if the groundwater model used in ER Section 4.2.2.1 to predict potential drawdown can be validated by comparing the model output to real STP site data including, if possible, pump test data available for the site. A groundwater pump test was performed in 1975 by Woodward-Clyde Consultants. However, the test was performed generally to determine if the wells installed were capable of producing the required amount of water for site operations and to determine pump settings within the wells to obtain the projected water needed for operations. The well test was also used to gather geotechnical data and water quality data. The test did, however, denote a groundwater boundary area along the Colorado River north of Production Well 5 (Woodward-Clyde 1975). The model used in the COLA Environmental Report was for a confined non-leaky aquifer. This model, although it more closely fits the geologic description at the site, is conservative due to the assumptions made in ER Section 4.2.2.1. The model does not take into account recharge to the aquifer. The assumptions made in the environmental report were that the aquifer is homogeneous, isotropic, of uniform thickness, and of infinite aerial extent. The assumptions also include that the potentiometric surface prior to pumping is horizontal; the well is pumped at a constant discharge rate for the entire period being evaluated; the well is fully penetrating (the STP wells are not) and flow is horizontal; the well diameter is infinitesimal so that storage within the well can be neglected; and water from storage is discharged instantaneously with decline of head.

Under current permit conditions and a confined non-leaky aquifer scenario, the actual drawdown resulting from the pumping of any current STP site well with a maximum design yield of 500 gpm (current maximum STP single well pump rate) a distance of 2,500 feet away would be 18 to 20 feet (without interference from other site pumping wells) during a projected 40-year operating period.

The increase in the site withdrawal rate to the current groundwater permit maximum for the additional water demand for Units 3 & 4 would create a similar potentiometric drawdown as

during the operation of the wells for Units 1 and 2. This is because the design yields of the wells have not been changed. And if pumped at the same rate would produce similar results.

In order to minimize groundwater drawdown, the wells could be pumped so that no two adjacent wells could be pumped sat the same time. This would prevent a coalescing of potentiometric surfaces which could result in a large area of drawdown.

ER Section 2.3.1.2.3.5 discusses water levels in Well 8015301 monitored by the Texas Water Development Board. The well is located approximately 6 miles northeast of the STP site in a zone of the deep aquifer that corresponds to the zone in which the STP production wells are located. Water levels from the well (Figure 2.3.1-27) generally indicate stable water conditions over the period of record. STP site deep aquifer Well 613 is located to the southwest of the proposed STP Units 3 & 4 in the influence area of STP Production Well 6. Well 613 showed a notable increase in water levels between 1996 and 1998 and a slight decline between 2004 and 2006. ER Section 2.3.1 Figure 2.3.1-28 shows recent groundwater elevations for Well 613. Section 2.3.1 indicates the drop in water level is most likely associated with a period of drought and not associated with pumping operations of STP wells. ER Figure 2.3.1-24 shows the potentiometric surface for the deep aquifer at the STP site. The figure indicates that the potentiometric surface flows toward the site's production wells indicating a localized effect. However, the figure indicates the drawdown is limited to onsite areas.

The water level monitoring results in ER Section 2.3.1 discussed above would indicate that the drawdown to the aquifer is local to the pumping wells and, therefore, less than the model used predicts. The difference could be accounted for if recharge to aquifer is considered. In fact, the data would indicate that the groundwater level in well 613 has been generally stable over the period of record. Due to the close proximity of the observation well to Pumping Well 6, the consistent water levels in the vicinity of the site would indicate the impact from the current operations of STP 1 & 2 was SMALL. Therefore, the impacts from STP pumping activities associated with the construction and operation of Units 3 & 4 on the wells in the vicinity of the site would be expected to be SMALL as well due to a similar pumping rate (design yield) being used.

A comparison of the model used in ER Section 4.2.2.1 to actual site and local field data would indicate the model used was conservative in its predictive output. However, the model matches the description of the aquifer (ER Section 2.3.1) at the site better than, for instance, a leaky confined model which would allow for recharge to the aquifer from over- and under-lying units and reduce the potentiometric drawdown from pumping activities.

CANDIDATE COLA REVISION:

No COLA revision is required as a result of this response.

The RAI 5.2-2 Response discusses potential changes to the ER concerning Impacts in section 4.2, 5.2 and 10.5S.

Question 4.3.1-1

QUESTION:

Identify and discuss habitats and important species associated with the 20-mile upgrade section of the Hillje transmission corridor

Full Text (Supporting Information):

The habitats and corridors for the existing STP transmission lines associated with Unit 3 and 4 operations are described in general terms in Table 2.2-4 of the ER. Additional information is needed to describe the importance of these habitat types to important species known to occur or that could occur within or adjacent to the 20-mile section of the Hillje corridor that will be upgraded. Provide a listing of these species and a discussion of their habitat use within or adjacent to this 20-mile section of the Hillje corridor.

RESPONSE:

ER text will be modified to specify habitats and T&E species in the vicinity of the STP to Hillje corridor. A table will be added indicating T&E species in the two-county area.

CANDIDATE COLA REVISION:

4.3.3.7.1 Transmission Corridors

As discussed in Subsection 2.2.2, no new transmission corridors have been proposed for STP 3 & 4; however, some upgrading of transmission line conductors would be necessary on one 20-mile long right-of-way between STP and the Hillje Substation. This corridor is contained in Matagorda County and a small portion of Wharton County. There would be small ecological impacts associated with noise/movement of construction equipment and workers involved in changing out conductors and installing replacement towers. This kind of work normally involves a crew with several flatbed "conductor trucks" (carrying large cable spools) and large bucket trucks. ~~. A variety of birds, small mammals, and larger mammals (white-tailed deer) could be disturbed by this activity, but the impact of this disturbance in most circumstances would be minor – animals moving away or avoiding the area for several days while crews are working. Many of the STP-associated transmission lines traverse mostly agricultural lands (Reference 4.3-11), thus there would be few animals using the corridors for activities other than foraging or possibly resting. Nesting of some ground-nesting birds (e.g., Northern bobwhite, wild turkeys, meadowlark, horned lark, killdeer) in adjacent habitats could be disrupted temporarily if these species are present and if the work is carried out during the spring/early summer nesting period. If work is carried out in non-nesting periods, impacts to birds will be SMALL and negligible.~~ As listed in Table 2.2-4, land use patterns associated with this 20-mile corridor are agricultural (87.2%), rangeland (10.3%), forest (1.3%), wetland (0.6%), and industrial (0.5%). The wetlands associated with the corridors occur at ditch/drainage crossings.

No wildlife refuges, natural areas, parks, or preserves are crossed by this corridor. Impacts to wetlands will be SMALL.

A variety of birds, small mammals, and larger mammals (white-tailed deer) could be disturbed by the transmission line upgrade, but the impact of this disturbance in most circumstances would be minor—animals moving away or avoiding the area for several days while crews are working. Due to the predominance of agricultural lands, there would be few animals using the corridors for activities other than foraging or possibly resting. Nesting of some ground-nesting birds (e.g., Northern bobwhite, wild turkeys, meadowlark, horned lark, killdeer) in adjacent habitats could be disrupted temporarily if these species are present and if the work is carried out during the spring/early summer nesting period. If work is carried out in non-nesting periods, impacts to birds will be SMALL and negligible.

There are 28 threatened and endangered species listed for Matagorda and Wharton counties (Table 4.3-1). Detailed information on several of these species is available in Subsection 2.4.1.1. No crustaceans, fish, insects or plants are listed for these counties. Three of the four listed mammals are generally considered extirpated from these counties, the exception being the manatee (*Trichechus manatus*) a marine mammal that would not be impacted by transmission corridor activities. Five of the ten listed reptiles are sea turtles which would not be impacted by transmission corridor activities. The Texas tortoise (*Gopherus berlandieri*) prefers dry scrub and grasslands, which are not common to this area. Texas horned lizards (*Phrynosoma cornutum*) use arid and semi-arid habitats which are not present in this region. The Texas scarlet snake (*Cemphora coccinea lineri*) is typically found in sandy thickets along the Gulf Coast, habitats not found within the transmission corridor. The smooth green snake (*Opheodrys vernalis*) prefers relict mesic coastal prairie grasslands uncommon to this corridor. Timber rattlesnakes (*Crotalus horridus*) are typically found in either swampy habitats or upland woodlands, preferring dense ground cover. Of the six federally listed avian species, the following species typically use coastal habitats, although they may traverse the corridor area during migratory movements: brown pelican (*Pelecanus occidentalis*), piping plover (*Charadrius melodus*), whooping crane (*Grus americana*). Interior least terns (*Sterna antillarum athalassos*) nest on riverine sand or gravel spits and forage on fish, but these kinds of aquatic habitats are lacking along this corridor. Attwater's greater prairie chickens (*Tympanuchus cupido attwateri*) are found only in relict tall grass coastal habitats, primarily on the Attwater's Greater Prairie Chicken National Wildlife Refuge near Eagle Lake, Texas. Eskimo curlews (*Numenius borealis*) are an endangered, likely extinct, migrant that historically traversed the tallgrass prairies of Texas. The remaining eight listed (state) avian species include four water birds not likely to be found near the transmission corridor and four hawk-like birds unlikely to be impacted by the corridor modification. Thus, impacts of the modification of the 20-mile corridor between STP and Hillje to sensitive species will be SMALL.

Other "important species" under NUREG 1555 include game species. Within the corridor region, these species likely include white-tailed deer (*Odocoileus virginianus*), rabbits (*Silvilagus* spp.), feral hogs (*Sus scrofa*), wild turkey (*Meleagris gallopavo*), northern bobwhite (*Colinus virginianus*), sandhill cranes (*Grus canadensis*), and mourning doves (*Zenaida macroura*). Due to the habitats present along the corridor and the temporary nature of the modification, impacts to game animals will be SMALL.

TABLE 4.3-1. PROTECTED SPECIES IN MATAGORDA AND WHARTON COUNTIES.

Scientific Name	Common Name	Federal Status[1]	State Status[1]
Birds			
Buteo albicaudatus	White-tailed hawk	-	T
Charadrius melodus	Piping plover	T	T
Egretta rufescens	Reddish egret	-	T
Falco peregrinus anatum	Peregrine falcon	DM	T
Falco peregrinus tundrius	Arctic peregrine falcon	DM	T
Grus Americana	Whooping Crane	E	E
Haliaeetus leucocephalus	Bald eagle	DM	T
Mycteria americana	Wood stork	-	T
Numenius borealis	Eskimo Curlew	LE	E
Pelecanus occidentalis	Brown pelican	DM	E
Plegadis chihi	White-faced ibis	-	T
Sterna antillarum anthalassos	Interior least tern	LE	E
Sterna fuscata	Sooty tern	-	T
Tympanuchus cupido attwateri	Attwater's prairie chicken	LE	E
Mammals			
Canis rufus	Red wolf	LE	E
Leopardus pardalis	Ocelot	E	E
Trichechus manatus	Manatee	LE	E
Ursus americanus luteolus	Louisiana black bear	T	T
Reptiles			
Caretta caretta	Loggerhead sea turtle	T	T
Cemophora coccinea lineri	Texas scarlet snake	-	T
Chelonia mydas	Green sea turtle	E	T
Crotalus horridus	Timber/canebrake rattlesnake	-	T
Dermochelys coriacea	Leatherback sea turtle	E	E
Eretmochelys imbricate	Hawksbill sea turtle	E	E
Gopherus berlandieri	Texas tortoise	-	T
Lepidochelys kempii	Kemp's ridley sea turtle	E	E
Liochlorophis vernalis	Smooth green snake	-	T
Phrynosoma cornutum	Texas horned lizard	-	T

[1] LE/E = Endangered; T = Threatened; C = Candidate; - = Not listed; DM = delisted taxon, recovered, being monitored for first five years post delisting;.

[2] Listed in the county containing the plant site (Matagorda County) and/or the counties containing the existing transmission lines (Y=Yes, - = no reported occurrence). Sources of county occurrences: TPWD 2008, USFWS 2008

(TPWD 2008) Texas Parks and Wildlife Department; available at http://gis.tpwd.state.tx.us/TpwEndangeredSpecies/DesktopDefault.aspx , accessed 6/2/2008.

(USFWS 2008) U.S. Fish and Wildlife Service, Ecological Services, Listing, County Lists, Lists of Endangered, Threatened, Proposed and Candidate Species for Texas, as of 2006; available at http://www.fws.gov/Southwest/es/EndangeredSpecies/lists/ListSpecies.cfm , accessed 6/2/2006.

Question 4.3.2-1

QUESTION:

What are the requirements for dredging in the Colorado River under the existing permits with the U.S. Corps of Engineers?

Full Text (Supporting Information):

Provide updated correspondence with U.S. Corps of Engineers concerning activities in preparation for Units 3 and 4 that were on-going after completion of ER Rev. 1.

RESPONSE:

Dredging operations at STP are authorized by two current U.S. Army Corps of Engineers (USACE) permits. Permit No. 10570(06), which extends through 2014, authorizes STPNOC to dredge a basin and discharge channel, place riprap, and construct a wharf, intake pumping station and spillway. The original permit has been amended six times, generally to extend the period of authorization. The most recent amendment (06) also initiated the Essential Fish Habitat consultation requirements of the Magnuson-Stevens Fishery Conservation and Management Act (Interagency coordination Notice, dated 10 Sept 2004). Approval for the time extension was granted in November, 2004, following interagency coordination.

Maintenance dredging at the Reservoir Makeup Pumping Facility (RMPF) is authorized under Permit No. 14848(04), originally issued March, 1981, and amended in March, 1989 (Amendment 02), January 1993 (Amendment 03), and June, 1999 (Amendment 04) to extend the time to complete the work. Amendment (02) added a special condition that work would comply with water quality certification and that the Permittee would notify the Corps of its intent to dredge as soon as reasonably possible prior to dredging. Amendment (03) extended the limit of dredging 25 feet waterward into the Colorado River.

A special condition of the original permit was that the Permittee notify the District Engineer if any potentially significant cultural resources are encountered during the project.

On June 9, 1999, authorization for STPNOC to conduct maintenance dredging was extended to December 31, 2009 (Amendment 03). A special condition was added that requires STPNOC to obtain a Section 401 water quality certification from TNRCC (now TCEQ) and submit it to the Galveston District of the USACE prior to the performance of hydraulic dredging. The time extension specified that all conditions of the original permit remained in full force and effect.

On July 1, 1999, TNRCC (now TCEQ) authorized STPNOC to use Nationwide Permit 16 under the condition that STPNOC agreed that their effluent from the upland contained disposal area would not exceed 300 mg/L total suspended solids (TSS). This authorization is the most recent correspondence between STPNOC and the regulating agencies regarding maintenance dredging of the intake channel.

CANDIDATE COLA REVISION:

No COLA revision is required as a result of this response.

Question 4.4-6

QUESTION:

Re-calculate traffic impacts based on more realistic assumptions.

Full Text (Supporting Information):

Section 4.4.2 of the ER states that "for purposes of analysis, it was assumed that 100% of the 4073 vehicles were attributable to the current STP labor force." This seems like an overestimate, since the plant workforce is about 1365. If they all arrived and left once a day and all drove alone, this would total about 2730. Recalculate peak traffic impacts, considering outage workers, contractors, and non-plant-related traffic in your estimate.

RESPONSE:

4073 = AADT, total current traffic (including STP and non-plant related traffic)
1365 = STP workers
5950 = construction workers
2000 = outage workers
1343 = non-plant related traffic, local traffic
2730 = STP traffic contributing to AADT count
1296 = 95% of STP workforce
955 = 70% of STP workforce
341 = 25% of STP workforce

CALCULATIONS
AADT minus STP:
4073-2730=1343 (67% of AADT is STP [2730 vehicles in 24-hr period])
4073-955-341=2777 (32% [95% (1296 vehicles) of current workforce during day/night shift change]) (1/3 of the AADT count at shift change)

Peak Time (10% of AADT on road during peak hour):
-277 (non-plant related traffic) (407 x 67% [less the 32% for STP traffic])
-5120 (day workers leaving) (70% of 7315)
-1829 (night workers arriving) (25% of 7315)
=7226 total vehicles during day/night shift change *, **

Maximum Threshold for FM 521= 5520 at Peak Hour (10% of 55,200)

*outage workers are not included because they will be on 12.5 hour shifts and will not be changing crews at this time of day.
**contractors and truck deliveries would be required to arrive and depart at alternate times than shift change to alleviate traffic congestion, and thus are not factored into the above analysis.

STP % Contribution To AADT Count

The AADT % attributed to STP is (67%)

The AADT counts take into account the current STP workforce as well as non-plant related traffic as these numbers were generated by TXDOT counting the local traffic which consists of STP workers and non-plant related traffic.

CANDIDATE COLA REVISION:

Section 4.4.2.2.4, Page 4.4-23, 6th paragraph

The 2005 AADT unidirectional count on FM 521 was totaled to arrive at an estimate of 4073 vehicles on FM 521 north of the STP site in a single 24-hour period. For purposes of analysis, it was assumed that ~~100%~~ 67% of the 4073 vehicles were attributable to the current STP labor force. STP makes up 2730 vehicles (1365 vehicles traveling FM 521 twice daily) of the AADT count, representing 67% of the total 4073 vehicles counted in a 24-hour period, while non-plant related local traffic makes up the remaining 33%. ~~After conservatively assuming that all traffic would be due to STP workers, it is assumed that all traffic on FM 521 would occur during shift change or operating hours.~~ With the addition of 5950 construction workers (Table 4.4-4) at peak construction, to the current 1365 employees total for three shifts in a 24-hour period (a total of 7315 workers), it is assumed that the afternoon shift change would result in the highest hourly traffic count as approximately 5120 day shift workers (70% of 7,315) leave and 1829 night shift workers (25% of 7315) arrive and 277 non-plant related vehicles would travel FM 521.

Question 4.4-7

QUESTION:

Calculate traffic impacts in congestion terms, not just impacts on pavements.

Full Text (Supporting Information):

The ER currently uses "esal" (equivalent standard axle load) -based estimate of traffic from plant construction to calculate traffic impacts. This variable is relevant to pavement cracking and deterioration, but not to congestion. Calculate how the shift-change construction traffic relates to peak-hour vehicle capacity and congestion.

RESPONSE:

TXDOT does not indicate or use an average peak-hour vehicle capacity time to average its AADT numbers, therefore, it is assumed that the maximum number of vehicles on FM 521 would be the day/night shift change plus 10% (value commonly used by department of transportation for other states) of the AADT count that is considered non-plant traffic (estimated to be 1,343, see Response to RAI 4.4-6 for calculations). Outage workers will be on 12.5 hour shifts and will not be changing crews at this time of day and contractors and trucks-contractors and truck deliveries would be required to arrive and depart at alternate times than shift change, so these vehicles are not included in the peak hour estimate. So the peak-hour is estimated at

134 (10% of AADT attributable to non-plant related traffic) (see response to RAI 4.4-6)
+5120 (STP and Construction day workers leaving) (70% of 7315)
+1829 (STP and Construction night workers arriving) (25% of 7315)
=7083 total vehicles during day/night shift change*, **

The Maximum Peak-Hour Threshold for FM 521= 5520 (10% of 55,200). Threshold would be exceeded at day/night shift change.

Although adding to the congestion on FM 521, particularly at the intersection of FM 1468 and FN 521, construction traffic will minimize disruption of existing traffic patterns by entering the site via the north where FM 1468 and FM 521 intersect, or the west entrance off FM 521. The current STP workforce will enter via the east entrance off FM 521, as usual.

CANDIDATE COLA REVISION:

ER Section 4.4.2.2.4 (Page 4.4-23) would be revised to:

Vehicle volume on the roads within a 24-hour period, as measured by a 24-hour Average Annual Daily Traffic (AADT) count and a "Functional Class" system (Texas Department of Transportation [TXDOT] does not use "Level of Service" [LOS] determinations for Texas roadways) ~~load zones as measured by esals~~, reflect the urban and rural character of the counties.

The 2000 Matagorda County population was 37,957. It is expected to increase 9% by 2010 and 18% by 2020 (Table 2.5-5); however, because most of the traffic on FM 521 in the vicinity of the STP site is related to STP 1 & 2 and because of the conservative assumptions STPNOC has made regarding the timing of plant traffic on FM 521, local traffic was not factored into the analysis.

~~Texas Department of Transportation (~~TXDOT~~)~~ considers ~~9600 passenger vehicles to equal one esal (the esal is currently the method used to compare axle weights of varying loads), or one 18,000 pound tractor trailer (Reference 4.4-27).~~ FM 521 to have a Functional Class of two-lane, undivided, rural major collector with a threshold capacity of 55,200 vehicles per day (Table 2.5-12) ~~is load zoned for 58,420 pounds equaling 3.25 tractor trailers, or 31,200 passenger vehicles~~ (Reference 4.4-28). ~~Load zone limits for roadways in Texas are calculated taking fatigue cracking, rutting, pavement thickness, and soil composition into consideration.~~ The daily traffic on FM 521 north of STP, as measured by the 2005 AADT count, was 2530 vehicles in the westerly direction and 1543 in the easterly direction in a single 24-hour period (Reference 2.5-29) (see Table 2.5-12). ~~Most traffic on FM 521 is related to STP, although there is a minimal amount of local traffic.~~

The 2005 AADT unidirectional count on FM 521 was totaled to arrive at an estimate of 4073 vehicles on FM 521 north of the STP site in a single 24-hour period. For purposes of analysis, it was assumed that ~~100%~~ 67% of the 4073 vehicles were attributable to the current STP labor force. STP makes up 2730 vehicles (1365 vehicles traveling FM 521 twice daily) of the AADT count, representing 67% of the total 4073 vehicles counted in a 24-hour period, while non-plant related local traffic makes up the remaining 33%. ~~After conservatively assuming that all traffic would be due to STP workers, it is assumed that all traffic on FM 521 would occur during shift change or operating hours.~~ With the addition of 5950 construction workers (Table 4.4-4) at peak construction, to the current 1365 employees total for three shifts in a 24-hour period (a total of 7315 workers), it is assumed that the afternoon shift change would result in the highest hourly traffic count as approximately 5120 day shift workers (70% of 7,315) leave and 1829 night shift workers (25% of 7315) arrive and 134 non-plant related vehicles would travel FM 521 for a total of 7,083 vehicles.

ER Section 4.4.2.2.4 (Page 4.4-24) would be revised to

The capacity of FM 521 is ~~31,200~~ 55,200 passenger vehicles in a 24-hour period, 5,520 during peak travel hours. ~~After factoring traffic from shift change and non-plant related traffic as measured by the AADT, there is sufficient capacity for an additional 20,178 45,177 (4,073 + 5950 5,120 + 1,829) passenger vehicles in a 24-hour period or an additional 840 1882 vehicles per hour. However,~~ Dduring day/night shift change, peak travel hour, capacity will be reached as 7,083 workers (134 [non-plant related traffic] + 5120 + 1829) travel on FM 521. As a measure to alleviate traffic congestion construction workers will enter the site from the north via the intersection of FM 1468 and FM 521, or the west entrance off FM 521. The current STP workforce will enter from the east entrance off FM 521. For the proposed construction schedule, road capacity could be reached during months 26 through 35. Traffic is expected to begin to abate during month 36 as fewer construction workers would be required for the remainder of construction (Figure3.10-1).

In addition to the operations and construction work force analyzed above, an average outage work force of approximately 1500 to 2000 workers per unit would use FM 521 for approximately 17-35 days during each refueling outage scheduled for each reactor every 18 months.

Question 4.4-8

QUESTION:

Calculate traffic interactions between STP and hurricane evacuations.

Full Text (Supporting Information):

What would be the quantitative impact of plant workforce during construction to traffic on hurricane evacuation routes Highways 60, 35, 36, 71, 332 and 288, FM 521, FM 1095, FM 1468?

RESPONSE:

It is assumed the construction workforce will settle similar to the current workforce (Table 4.4-2, Page 4.4-44).

Current workforce:
Matagorda County (Pop. 37,957) =60.7 %=(60.7% of 1365=829),
Brazoria County (Pop. 241,767) =22.4 %=(22.4% of 1365=306),

Construction Workforce (including family members, it is assumed families would have the national average of 1.9 vehicles per household [The 2001 National Household Travel Survey, household file, U.S. Department of Transportation]):
Matagorda County=60.7% of 5950=3612 vehicles x 1.9 =6,863
Brazoria County=22.4% of 5950=1333 vehicles x 1.9 =2,533

There would be an increase of 6863 vehicles on evacuation routes in Matagorda County and an increase of 2533 vehicles on evacuation routes in Brazoria County.

Matagorda County routes (Evacuation and non-evacuation): Hwy 60, 35, 71, FM 521, 1095 and 1468=an additional 1,143 vehicles temporarily per route.
Brazoria County routes (evacuation and non-evacuation): Hwy 36, 288, 332=an additional 844 vehicles temporarily per route.

The 2001 National Household Travel Survey, household file, U.S. Department of Transportation is available online at:

http://www.bts.gov/publications/highlights_of_the_2001_national_household_travel_survey/html/table_a02.html

CANDIDATE COLA REVISION:

Section 4.2.2.4 (Page 4.4-24)

The designated Hurricane Evacuation Routes for Matagorda County are Highway 60, Highway 35, Highway 71, and FM 1095 (Figure 2.5-4) (with FM 521 and 1468 seeing transitional traffic in route to designated evacuation routes). In Brazoria County, the designated evacuation routes are State Highway 36 and State Highway 288 (Figure 2.5-4 and Subsection 2.5.2.2) (with Hwy 332 seeing transitional traffic in route to designated evacuation routes). The addition of 5950 construction workers at peak construction would result in an increase in traffic, should the need to evacuate arise, of an additional 1,143 vehicles per route for Matagorda County and an additional 844 vehicles per route for Brazoria County. Staggered departure times and counterflow on major roadways are commonly used during evacuations to alleviate traffic congestion.

Question 4.4-9

QUESTION:

Discuss the impacts of any interactions between the re-built rail spur and road traffic, especially on FM 521.

Full Text (Supporting Information):

If the rebuilt railroad spur would cross FM 521 on a grade crossing, what would be the impact on traffic flow on FM 521 and what actions would be taken to avoid impact? Discuss the impacts of any interactions between the re-built rail spur and road traffic congestion, especially on FM 521.

RESPONSE:

Rail spur equipment/material deliveries would be scheduled for non-peak traffic times

Non-plant related traffic is minimal (1342 vehicles in a 24-hour period or 56 vehicles per hour) and is not expected to be impacted by occasional rail traffic crossing FM 521.

The addition of 5950 construction workers to FM 521 is not expected to be impacted by rail traffic for the reasons stated above.

CANDIDATE COLA REVISION:

No COLA revision is required as a result of this response.

Question 4.4-10

QUESTION:

Discuss the impact of construction on housing demand.

Full Text (Supporting Information):

The quantitative housing impact analysis appears to assume that the incoming construction workforce would occupy permanent housing. Discuss the likelihood of RVs and mobile homes as a housing choice, in view of the heavy reliance of these types of housing utilized during construction of units 1 and 2.

RESPONSE:

The housing analysis does mention the possibility of workers bringing their own housing, which would consist of "portable" housing such as RVs, campers, or mobile homes. In our discussions with local officials and residents, we were unable to obtain information on worker housing choices when Units 1 & 2 were built, especially regarding the use of portable housing. Certainly, many construction workers would bring their own housing. To clarify these issues, we propose the following addition to the ER.

CANDIDATE COLA REVISION:

Section 4.4.2.2.6, Construction:
Add the following after Paragraph 4 (the last paragraph of that subsection):

As noted above, some construction workers would elect to bring their own housing, such as RVs, mobile homes, campers, or other types of portable housing. These housing choice decisions would be influenced by workers' expected length of time at the work site, whether they are accompanied by household members, the cost, availability, and condition of local housing, and the distance from the family home. In turn, additional factors such as the capacity and quality of local schools and the cost of vehicle fuel could influence a worker family's decision regarding accompanying the worker to the construction site. Due to the multitude of factors, it is not possible to predict the proportion of workers who would choose portable housing over local housing units. However, to the extent that workers do bring mobile housing, the demand for local housing units would be reduced, and there would be less upward pressure on home prices and rent that could adversely affect lower-income and other residents of the ROI. With a greater number of workers bringing their own housing, impacts to the local housing market, both owner-occupied homes and rentals, would be less noticeable both during and after the construction period.

Question 4.4-11

QUESTION:

Discuss impact of STP 3 & 4-related population growth on social services demands.

Full Text (Supporting Information):

Although the staff found in some of its interviews that, historically, STP 1 & 2 led to some increase in adverse social impacts, the social services section does not discuss impacts on programs such as Child and Family Services, Food Stamps, alcohol and drug abuse programs, and other social service programs and non-governmental charities. Discuss why not or provide an assessment of the impacts.

RESPONSE:

The available information on nuclear power plant construction worker characteristics does not address their demands on local social service agencies. However, there is much more awareness of the need for such programs, and the extent of their applicability, than was the case in the 1970s, and more programs are available, both government- and non-government-sponsored. Therefore, we have added a qualitative discussion of the impacts on such agencies. The discussion focuses on Matagorda County because the population influx would primarily affect that county.

CANDIDATE COLA REVISION:

Section 4.4.2.2.7, Public Services, Social Services: Insert the following paragraphs at the end of that section.

The construction of STP 3 & 4 is expected to bring 5056 additional residents into Matagorda County during peak construction, representing an increase of approximately 13.3% over the County's population in 2000. It is likely that some of the new residents would require assistance from these or other agencies at some time during their stay. Because the incoming workers are expected to be paid higher wages than the local average, it is unlikely that the in-migrants would create excessive demands on agencies that provide economic assistance, although other types of support may be required. It is not possible at this time to determine the extent to which demand for social services would increase, but impacts are expected to be SMALL.

In addition to government-provided services, a number of non-governmental agencies provide services to residents of Matagorda County. These non-profit, faith-based, or other types of organizations provide a wide range of social services that address disaster relief, substance abuse, domestic violence, illness, the needs of the elderly, economic hardship, and other issues. In addition, organizations such as the Boy Scouts, Girl Scouts, and 4-H provide opportunities for youths. Table 4.4-9 lists organizations that are part of the Matagorda County United Way; these represent a sample of all social service organizations in Matagorda County. While some

newcomers would need services provided by the community, others would no doubt chose to participate in activities offered by the Boy Scouts, Girl Scouts, or similar opportunities, and some would choose to volunteer or donate funds. The higher personal income expected in the ROI from the construction of STP 3 & 4 is likely to lead to increased donations to agencies from firms and individuals. Although it is not possible to estimate changes in demand for specific services, or the amount of increased contributions, impacts are expected to be SMALL.

Table 4.4-9. United Way Social Service Agencies, Matagorda County

MCUW Agencies	# Clients Last Fiscal Year	% Budget From UW For 2001	Dollars Received From UW & Grants Received Using UW Funding As A Matching Funds	% Of Budget From UW & Grants Matched By UW Funds
Matagorda County United Way & HELPLINE	9000	100%	$30,000	100%
American Red Cross- Bay City Chapter	17000	45%	$49,500	51%
Association for Retarded Citizens	69	48%	$31,000	48%
Bay City Day Care	400	7%	$32,500	10%
Bay City Community/ Salvation Army Food Pantry	9000	32%	$4,500	32%
Boy Scouts	1132	1%	$10,000	1%
Boys & Girls Club-Palacios	369	19%	$46,000	95%
Caring & Sharing Food Pantry	10,332	26%	$12,000	53%
Court Appointed Special Advocates	746	16%	$93,900	99%
Council on Substance Abuse	1321	3%	$473,454	99%
DARE-BCISD	2,000	3%	$1,000	3%
DARE-TISD	600	3%	$1,000	3%
Economic Actions Committee	2043 utilities/nutrition	8%	$45,617	12%
4-H Marine--Sea Masters	142	25%	$1,000	25%
Friends of Elder Citizens	425 daily meals	9%	$423,000	76%
Girl Scouts	224	1%	$9,500	1%
Kids in Distress	25	79%	$11,695	84%
Literacy Volunteers of America	62	30%	$34,500	100%
Matagorda Episcopal Hospital Outreach Program (MEHOP)	2657	6%	$68,862	24%
Rainbow Land Day Care	70 daily	23%	$55,580	100%
Salvation Army - Bay City Service Unit	1228	10%	$29,757	25%
Teen Court	1685	19%	$85,000	100%
Women's Crisis Center	1600	6%	$510,793	91%
Total Dollars Received			$2,060,158	

Source: Reference 4.4-44 [Matagorda County United Way, Agency Statistics. Last updated April 17, 2003. Available at http://www.man-net.org/Social%20Services/united_way/Agency%20Statistics.htm]
vices/united_way/Agency%20Statistics.htm].

Question 4.4-13

QUESTION:

Estimate expenditures within the region for materials and services during construction.

Full Text (Supporting Information):

Estimate expenditures within the region for materials and services during construction. Provide qualitative information, if quantitative information is not available, on the order of magnitude, scale, and type of local expenditures that are expected.

RESPONSE:

STPNOC is providing estimated expenditures; this information was assessed within the context of Texas, Bay City, and Palacios sales tax revenues for the latest available year. For the purposes of analysis, it was assumed that all expenditures would be subject to taxation by the appropriate taxing entity. Because it is unlikely that 100 percent of the expenditures would occur within Bay City or Palacios, a sensitivity analysis was performed to assess the impacts to each jurisdiction based on the percentage (from 10% to 100%) spent within that jurisdiction. Note that although a complete sensitivity analysis was completed for the City of Palacios, it is not possible that more than a small proportion of materials and services could be purchased within Palacios, because of its limited retail opportunities.

CANDIDATE COLA REVISION:

Section 4.4.2.2.2, Sales and Use Taxes, Expenditures for Construction Goods and Services
The following paragraph is to be added following the last paragraph in this section, and the accompanying table to be inserted as appropriate within the tables for Section 4.4.

In addition to the construction expenditures noted above, STPNOC has estimated expenditures for goods and services during the construction period, at $212.7 million for construction-related items and $13.4 million for office or administrative items. To approximate the impact on state and local sales tax revenues, the total of $226.1 million was divided by 7 (years in construction period) to obtain an average annual expenditure amount ($32.3 million), which was then taken as a percentage of increase over the latest year for which actual sales tax revenues were available. It was assumed that none of the items is exempt from sales tax, and that all are subject to Texas sales or use tax. Because of the limited retail opportunities in Bay City and Palacios, a sensitivity analysis was performed to assess the range of impacts from spending 10% to 100% in each jurisdiction. The analysis also addressed the uncertainty regarding private/public ownership of STP 3 & 4 (as noted above, STP 1 & 2 are currently 44% investor-owned and 56% publicly-owned). Only the privately-owned segment is subject to sales tax. Therefore, scenarios for 44%, 60%, 80%, and 100% private ownership were assessed. The analysis is presented in Table 4.4-8.

Depending on the ownership scenario, annual Texas sales tax revenues would range from $888,230 to $2.0 million, representing an increase over 2006 sales tax revenues from 0.005% to 0.011%, a SMALL and positive impact.

Annual impacts to Bay City or Palacios tax revenues were estimated to range from a low of $28,423 (44% private ownership with only 10% subject to local taxation) to $645,986 (100% private ownership and 100% spent in either city). (Both cities impose a 2% sales tax, so the potential sales tax revenues are identical.) The associated increases over Bay City's 2005 sales tax revenues ($3.7 million) range from 0.8% to 17.5%, while the increases over Palacios' 2006 sales tax revenues ($219,500) could range from 12.9% to 294.3%. However, because of the limited availability of goods and services, it is unlikely that a major proportion of expenditures would occur in Bay City. At the present time, it is not possible that more than a small proportion of purchases would occur in Palacios, whose population is roughly one-fourth of Bay City's. Based on current retail opportunities, it is likely that impacts to either locale would be positive and SMALL to MODERATE. However, if additional STP suppliers were to locate within either city, sales tax revenue impacts could range from SMALL to LARGE.

Table 4.4.2-8. Estimated Sales Tax Impacts of Expenditures For Goods & Services During Construction of STP Units 3 & 4

Summary of Estimated Construction-Period Expenditures:	**Estimated Amount**
Construction and Maintenance Equipment, Supplies, & Services	$212,671,000
Office and Administrative Equipment, Supplies & Services	$13,424,000
Total Estimated Expenditures, Construction Period	**$226,095,000**
Average Annual Expenditures (7-year construction period)	**$32,299,286**

Estimated Annual Impacts to Texas Sales Tax Revenues[1]

State sales tax revenues, 2006[2]	$18,275,209,754							
State sales tax rate[3]	6.25%							
Ownership Scenario:	**44% Private Ownership**		**60% Private Ownership**		**80% Private Ownership**		**100% Private Ownership**	
Assumes 100% of Expenditures Subject To State Tax	**State Sales Tax**	**% of 2006 Sales Tax Revenues**	**State Sales Tax**	**% of 2006 Sales Tax Revenues**	**State Sales Tax**	**% of 2006 Sales Tax Revenues**	**State Sales Tax**	**% of 2006 Sales Tax Revenues**
State Sales Tax	$888,230	0.005%	$1,211,223	0.007%	$1,614,964	0.009%	$2,018,705	0.011%

Estimated Annual Impacts to Bay City Sales Tax Revenues[1]

Bay City sales tax revenues, 2005[4]	$3,681,595							
Bay City sales tax rate[5]	2.0%							
Ownership Scenario:	**44% Private Ownership**		**60% Private Ownership**		**80% Private Ownership**		**100% Private Ownership**	
% of Expenditures Subject to Bay City Sales Tax	**Bay City Sales Tax**	**% of 2005 Sales Tax Revenues**	**Bay City Sales Tax**	**% of 2005 Sales Tax Revenues**	**Bay City Sales Tax**	**% of 2005 Sales Tax Revenues**	**Bay City Sales Tax**	**% of 2005 Sales Tax Revenues**
100.00%	$284,234	7.7%	$387,591	10.5%	$516,789	14.0%	$645,986	17.5%
90.00%	$255,810	6.9%	$348,832	9.5%	$465,110	12.6%	$581,387	15.8%
80.00%	$227,387	6.2%	$310,073	8.4%	$413,431	11.2%	$516,789	14.0%
70.00%	$198,964	5.4%	$271,314	7.4%	$361,752	9.8%	$452,190	12.3%
60.00%	$170,540	4.6%	$232,555	6.3%	$310,073	8.4%	$387,591	10.5%
50.00%	$142,117	3.9%	$193,796	5.3%	$258,394	7.0%	$322,993	8.8%
40.00%	$113,693	3.1%	$155,037	4.2%	$206,715	5.6%	$258,394	7.0%
30.00%	$85,270	2.3%	$116,277	3.2%	$155,037	4.2%	$193,796	5.3%
20.00%	$56,847	1.5%	$77,518	2.1%	$103,358	2.8%	$129,197	3.5%
10.00%	$28,423	0.8%	$38,759	1.1%	$51,679	1.4%	$64,599	1.8%

Estimated Annual Impacts to Palacios Sales Tax Revenues[1]								
Palacios sales tax revenues, 2005[6]					$219,500			
Palacios sales tax rate[5]					2.0%			
Ownership Scenario:	44% Private Ownership		60% Private Ownership		80% Private Ownership		100% Private Ownership	
% of Expenditures Subject to Palacios Sales Tax	Palacios Sales Tax	% of 2005 Sales Tax Revenues	Palacios Sales Tax	% of 2005 Sales Tax Revenues	Palacios Sales Tax	% of 2005 Sales Tax Revenues	Palacios Sales Tax	% of 2005 Sales Tax Revenues
100.00%	$284,234	129.5%	$387,591	176.6%	$516,789	235.4%	$645,986	294.3%
90.00%	$255,810	116.5%	$348,832	158.9%	$465,110	211.9%	$581,387	264.9%
80.00%	$227,387	103.6%	$310,073	141.3%	$413,431	188.4%	$516,789	235.4%
70.00%	$198,964	90.6%	$271,314	123.6%	$361,752	164.8%	$452,190	206.0%
60.00%	$170,540	77.7%	$232,555	105.9%	$310,073	141.3%	$387,591	176.6%
50.00%	$142,117	64.7%	$193,796	88.3%	$258,394	117.7%	$322,993	147.1%
40.00%	$113,693	51.8%	$155,037	70.6%	$206,715	94.2%	$258,394	117.7%
30.00%	$85,270	38.8%	$116,277	53.0%	$155,037	70.6%	$193,796	88.3%
20.00%	$56,847	25.9%	$77,518	35.3%	$103,358	47.1%	$129,197	58.9%
10.00%	$28,423	12.9%	$38,759	17.7%	$51,679	23.5%	$64,599	29.4%

[1] Note: Assumes that these expenditures are subject to sales tax.
[2] Reference 2.5-25
[3] Reference 2.5-27
[4] Reference 2.5-46
[5] Reference 2.5-30
[6] Reference 2.5-109 [City of Palacios 2007-2008 Annual Budget, Approved 09/18/2007

Question 4.4-15

QUESTION:

List commitments to reduce physical impacts of construction.

Full Text (Supporting Information):

The text notes for example: "As presented in Subsection 3.9S.2.1, procedures related to mitigating noise and vibration impacts from construction activities may include measures such as restricting noise and vibration generating activities to daylight hours, prohibiting construction traffic from driving on specific roads and through specific neighborhoods, use of less vibration producing equipment and/or methods (e.g., dampeners, staggering activities), and verifying that noise control equipment on vehicles and equipment is in proper working order. Notifications to regulatory agencies and nearby residents regarding atypical noise and vibration events (e.g., pile driving, steam/air blows) may also be performed." These actions seem to be noted as generic options. Identify which of these are commitments.

RESPONSE:

Section 4.4.1.2 discusses projected noise levels associated with construction activities. Construction workers are covered by OSHA worker protection requirements for hearing protection. Attenuation of noise, through distance, associated with STP 3 & 4 construction activities is expected to result in noise levels less than 65 dBA at the Exclusion Ares Boundary. As reported in NUREG-1437, and referenced in NUREG-1555, noise levels below 65 dBA are considered of small significance. If construction related noise does result in offsite impacts, the appropriate mitigation will depend on the location of the affected persons and the nature of the construction activities. The actions and mitigation measures should not be considered commitments, but as options to be considered if the need arises. It would be premature to possibly preempt the best management option for the circumstances at this time.

CANDIDATE COLA REVISION:

No COLA revision is required as a result of this response.

Question 4.4-16

QUESTION:

List commitments to reduce traffic impacts of construction.

Full Text (Supporting Information):

"Public roads may be altered (e.g., widened, turn lanes installed) as a result of construction activities." Is this a commitment? If not, what circumstances would make it become a commitment?

RESPONSE:

The ER contains no commitments. Mitigation measures should not be considered commitments, but options to be considered if the need arises.

The Texas Department of Transportation (TxDOT) would be in charge of any upgrades, alterations or construction activities performed on FM 521. More specifically TxDOT's, Transportation Planning and Programming Division, utilizing the Statewide Transportation Improvement Program (STIP) Fiscal Years 2008-2011 (required under Title 23, United States Code (USC), Section 135 Statewide Planning, (f) Statewide Transportation Improvement Program), would be used when addressing any road improvement needs. Federal regulations, along with regional policies and practices, establish the process by which transportation projects are selected, modified, and implemented.

Additionally, the Texas Transportation Commission (commission) and TxDOT use the Unified Transportation Program (UTP) as a ten-year programming document to authorize and guide transportation project development and construction on Texas' intermodal transportation network. The UTP is comprised of two documents that are updated, and adopted by the commission annually: The Statewide Preservation Program (SPP), and the Statewide Mobility Program (SMP).

Final and specific requirements would be detailed in the applicable TxDOT program permit.

While it is not STPNOC's role to build new roads for the State, STPNOC would be available to consult with agencies/municipalities to help them develop appropriate mitigation actions or strategies if they so desire.

Circumstances that would necessitate alterations/construction of public roads would be based on the TxDOT programs mentioned above.

CANDIDATE COLA REVISION:

No COLA revision is required as a result of this response.

Question 4.4-17

QUESTION:

List commitments to reduce physical impacts of construction.

Full Text (Supporting Information):

"The following controls or similar ones could be incorporated into activity planning to further minimize noise and associated impacts:

- Regularly inspecting and maintaining equipment to include noise aspects (e.g., mufflers)
- Restricting noise-related activities (e.g., pile-driving) to daylight hours
- Restricting delivery times to daylight hours"

Identify which of these actions are commitments.

RESPONSE:

The ER contains no commitments. Mitigation measures should not be considered commitments, but options to be considered if the need arises.

Section 4.4.1.2 discusses projected noise levels associated with construction activities. Construction workers are covered by OSHA worker protection requirements for hearing protection. Attenuation of noise, through distance, associated with STP 3 & 4 construction activities is expected to result in noise levels less than 65 dBA at the Exclusion Area Boundary. As reported in NUREG-1437, and referenced in NUREG-1555, noise levels below 65 dBA are considered of small significance. If construction related noise does result in offsite impacts, the appropriate mitigation will depend on the location of the affected persons and the nature of the construction activities. The actions and mitigation measures should not be considered commitments, but as options to be considered if the need arises. It would be premature to possibly preempt the best management option for the circumstances at this time.

CANDIDATE COLA REVISION:

No COLA revision is required as a result of this response.

Question 4.6-2

QUESTION:

Indicate which actions to limit adverse impacts during construction are commitments.

Full Text (Supporting Information):

A number of actions are identified in the table "Summary of Potentially Adverse Impacts of Construction" with respect to limiting impacts on direct physical impacts (4.4.1) and socioeconomic impacts (4.4.2). Which of these potential actions are actually commitments to take action by the applicant, as opposed to potential actions that could be taken by unspecified parties?

RESPONSE:

The ER contains no commitments. Mitigation measures should not be considered commitments, but options to be considered if the need arises.

Section 4.4 summarizes the potential adverse environmental impacts which may result from construction of STP 3 & 4 and proposes possible mitigation measures to be implemented. The actions and mitigation measures should not be considered commitments, but as options to be considered if the need arises. It would be premature to possibly preempt the best management option for the circumstances at this time.

CANDIDATE COLA REVISION:

No COLA revision is required as a result of this response.

Question 5.2-1

QUESTION:

Discuss the incremental change in the availability of the water resource, and the incremental change in groundwater drawdown as an impact of station operation on potential water users.

Full Text (Supporting Information):

Discuss the impact of station operation on potential water users. Describe this in terms of the incremental impact potential seen by offsite users of water resource. What are the magnitude, duration, and frequency of the loss of surface and groundwater resources to other users due to the operation of Units 3 and 4?

RESPONSE:

STP Units 3 & 4 operations (ER Section 3.3) would use a maximum of 44,779 gallons per minute [gpm (99.9 cubic feet per second (cfs)] of water from the main cooling reservoir (MCR). Normal operations would require 42,604 gpm (95 cfs). Water is pumped from the Lower Colorado River Segment 1401 to the MCR via the reservoir makeup pumping facility (RMPF).

The Unit 3 & 4 operation pumping magnitude, duration, and frequency would depend on the water quality within the MCR, MCR water level, and flow of the Colorado River.
Diversion from the Colorado River for the current 2-unit and the proposed Units 3 & 4 operation is limited by Texas Commission on Environmental Quality (TCEQ) Certificate of Adjudication (No. 14-5437) with a priority date of June 10, 1974. The document sets limits on a river water maximum withdrawal rate of 1200 cfs, and maximum annual withdrawal of 102,000 acre-feet per year. As a special condition of the permit, STPNOC is permitted to only withdraw 55% of the water from the river for use in excess of a minimum flow of 300 cfs.

As indicated in Table 2.3.2-A, the available surface water to the Lower Colorado Regional Water Planning Group was 930,808 acre-feet per year in 2000 and is projected to be 924,975 acre-feet per year in 2060. Water available for use in the Colorado River was 910,730 acre-feet per year in 2000 and 904,652 acre-feet per year projected for 2060.

The STP unit 3 & 4 normal water withdrawal of 42,604 gpm (68,733 acre-feet per year) would represent 7.5% of the 2060 available surface water. The permitted withdrawal of 102,000 acre-feet per year would represent 11.3% of the available surface water in the Colorado River and approximately 11% of the surface water available to the region.

As indicated in RAI 2.3-4 Table 2.3.2-4 (Reference 2.3.2-7), the major users of surface water from the Colorado River in Matagorda County are STP, the LCRA, and OXEA. No surface water is withdrawn for municipal water supply from this river reach. The closest upstream public

water supply to the STP site that uses the Colorado River as its water source is located in the vicinity of the city of Austin (Reference 2.3.2-9). As of February 25, 2008, there are no existing or pending permits to withdraw surface water from Colorado River Segment 1401 downstream of the RMPF (Ramirez 2008).

The impact to groundwater availability is discussed in RAI 2.3-12 Response.

Table 2.3.2-A
Groundwater and Surface Water Supplies Available to the LCRWPG

Supply Source	**Available Supply (acre-feet per year)**		
	Year 2000	**Year 2030**	**Year 2060**
Groundwater			
Gulf Coast Aquifer	198,425	198,425	198,425
Carrizo-Wilcox Aquifer	28,400	28,400	28,400
Edwards Aquifer (Balcones Fault Zone)	8,375	8,375	8,375
Trinity Aquifer	16,782	16,440	15,717
Edwards-Trinity (Plateau) Aquifer	1,657	1,657	1,659
Hickory Aquifer	27,380	27,380	27,380
Queen City Aquifer	3,991	3,991	3,991
Sparta Aquifer	9,889	9,889	9,889
Ellenburger-San Saba Aquifer	23,574	23,574	23,574
Marble Falls Aquifer	18,305	18,305	18,305
Other Aquifer [1]	13,558	13,611	13,632
Groundwater Subtotal	**350,336**	**350,047**	**349,347**
Surface Water [2]			
Brazos River Basin	566	566	566
Brazos-Colorado Coastal River Basin [3]	9,649	9,787	9,894
Colorado River Basin [4]	910,730	902,857	904,652
Colorado-Lavaca Coastal River Basin	4,289	4,289	4,289
Lavaca River	4,671	4,671	4,671
Guadalupe River Basin [5]	903	903	903
Surface Water Subtotal	**930,808**	**923,073**	**924,975**
Supplies from other regions [6]	**2,127**	**713**	**1,041**
Total LCRWPA Water Availability	**1,283,271**	**1,273,833**	**1,275,363**

Notes:
1. Other Aquifer refers to alluvial aquifer water supplies.
2. Includes local supplies determined from 2001 Plan.
3. Includes a water right from the San Bernard River with unconfirmed reliability.
4. Includes firm supplies determined from "No Call" Colorado River WAM for reservoirs and run-of-river water rights.
5. Includes firm supplies determined from Guadalupe River Basin WAM.
6. Includes groundwater and surface water from the Brazos, Colorado, and Guadalupe River

CANDIDATE COLA REVISION:

No COLA revision is required as a result of this response.

Question 5.2-2

QUESTION:

Address inconsistencies in the ER regarding groundwater impact levels.

Full Text (Supporting Information):

There appears to be an inconsistency in the ER regarding the impacts to the groundwater resource during construction, operation, and cumulative impacts. All use the full 3000-acre-ft/year rate; however, different impact levels are concluded.

Reconcile how the analysis of the operational impacts to the deep Chicot aquifer conclude a SMALL impact when a conclusion of SMALL to MODERATE has been reached as a result of construction impacts in the same aquifer. Both analyses considered pumping the aquifer at its maximum permitted level (3000 acre-ft/yr).

Provide the basis for how cumulative impacts to groundwater during construction can be estimated to be SMALL when the conclusion in the construction impact section is SMALL to MODERATE with possible mitigation involving the construction of additional deep aquifer wells.

While the cumulative operational impact conclusion of SMALL is consistent with the earlier conclusion in the operational impacts section, it does not appear to be consistent with the SMALL to MODERATE impact conclusion of the construction impacts section.

Present a basis for the evaluation of impacts to the groundwater resource. Such a basis should include several metrics including the sustainable groundwater resource and drawdown at offsite locations, and it should allow construction and operation impacts to be compared for consistency.

RESPONSE:

The impacts associated with Section 4.2, 5.2 and 10.5S.1.2 should be SMALL. The SMALL to Moderate was an error that was not corrected when the sections were reviewed.

Please refer to RAI 2.3-12 Response.

CANDIDATE COLA REVISION:

ER Section 4.2, Page 4.2-11, second paragraph will be changed as follows:

STPNOC concludes that impacts due to increased pumping during construction activities to the deeper portion of the Chicot Aquifer would be SMALL ~~to MODERATE~~ and would not warrant mitigation. A reduction in drawdown potential could be obtained by the permitting of additional production wells within the same aquifer sequence that would be used to supply groundwater during construction. This would allow STP to decrease the actual pumping rate at each well location, thereby spreading out the potential drawdown impacts across the STP site and reducing the effect each of the individual wells would have on offsite well locations while pumping within the current permitted rate of 1860 gpm (3000 acre-feet per year).

Question 5.2-3

QUESTION:

Describe quantitatively the known impacts and qualitatively the potential future impacts on the groundwater system.

Full Text (Supporting Information):

The ER section 5.2.3.1 regarding water quality impacts during operation does not address chemical impacts on the groundwater system despite the communication between the MCR and the shallow aquifer in the conceptual model. Describe these known impacts quantitatively and the potential future impacts qualitatively. Present the radionuclide and chemical levels that exist in the MCR and the portion that could be introduced to the shallow aquifer in the future. Address how present-day measured levels could change from MCR operation under STP 1 & 2 to that under the operation of all four units.

RESPONSE:

As indicated in ER Section 2.3.2, the water is made up to the Main Cooling Reservoir (MCR) from the pumping of water from the Colorado River. Therefore, the water quality of the MCR should basically be that of the Colorado River. However river water quality is dependent upon the river flow rate. Since there has been no operational blowdown from the MCR (a blowdown test was performed in 1997), the concentration of salts and metals in the MCR would change based on the water quality of the river when pumping to the MCR occurs and during operational releases to the MCR. As indicated in ER Section 2.3.3 Table 2.3.3-5, during the period from 1995 through 2005 tritium has been detected in the MCR at concentrations below the Environmental Protection Agency (EPA) drinking water standard of 20,000 picocuries per liter (pCi/L) (FR 2000). The concentrations ranged from 2330 pCi/L to 17,410 pCi/L. Tritium concentrations have been measured in Relief Wells located within the MCR dike. Concentrations in Relief Well 701 (ER Table 2.3.3-6) from 1995 through 2005 and in Relief Well 238 from 1990 through 1994. Concentrations ranged from 2842 pCi/L in Relif well 701 during 1996 to7672 pCi/L during 1998 and were below the EPA drinking water standards. Concentrations in Relief Well 238 during the period from 1990 through 1994 ranged from zero during 1990 and 1994 to 5497 pCi/L during 1994. All results were below EPA drinking water levels for tritium. As indicated in ER Table 2.3.3-10, tritium concentrations have been detected in STP site Piezometer Wells ranging from less than lower laboratory detection limits to 444 pCi/L. These concentrations are much less than the EPA drinking water level concentration limit of 20,000 pCi/L.

As discussed in ER Section 2.3.3 Table 2.3.3-9, radiological monitoring was performed during 2005 on six site groundwater monitoring wells in the Radiological Environmental Monitoring Program (REMP). The results of the analyses indicated tritium as the only radionuclide above laboratory detection limits at 1200 picocuries per kilogram.

Water quality (ER Table 2.3.3-3) within the MCR during 2006 sampling events also indicated the presence of chloride, manganese, iron, and aluminum above EPA Secondary Drinking Water Regulation standards (EPA 2008).

A conservative estimate would be that the operation of Units 3 & 4 could increase the radionuclide concentration within the MCR. Should the concentration within the MCR increase due to operations of Units 3 & 4, the concentration of tritium within the MCR could increase to a concentration in excess of the 20,000 pCi/L EPA drinking water standard. This estimate could vary depending upon actual plant operations, precipitation, and MCR operations. The impact to the shallow portion of the aquifer from the migrating concentration would be less due to dilution of the migrating concentration by the groundwater. The concentration of chemicals, salts/metals, and radionuclides migrating to the shallow groundwater beneath the MCR will in part be dependent on the operating level of the MCR. The current level of approximately 47 feet will be raised to 49 feet for four unit operation. The increased MCR head of two feet will increase the migration rate of contaminants to the upper portion of the shallow aquifer. However, increasing the head by two feet would also dilute the concentration of the analytes within the waters of the MCR.

However, at some point in the future during the operation of all four units, blowdown would be required to improve the water quality in the MCR. Blowdown would allow STP to release an amount of water of elevated specific conductivity from the MCR to the Colorado River and replace it with water from the Colorado River during a period of higher flow (the greater the flow rate, the greater the possibility of pumping higher quality water). This would dilute the concentrations within the MCR and reduce the amount concentration of analytes seeping from the MCR or being discharged to the surface from the pressure relief wells. Also, blowing down during a high river flow rate event would dilute the concentration of the blowdown water and also any analytes it would contain.

CANDIDATE COLA REVISION:

No COLA revision is required as a result of this response.

Question 5.3.1.2-1

QUESTION:

Describe the design feature of the RMPF that allows an "escape route" for fish to swim back to the river and precluding entrapment.

Full Text (Supporting Information):

Section 5.3.1.2.1 Describe design features of the RMPF that preclude or mitigate entrapment of fish. Is the "escape route" the fish return system on the intake structure, or is it some other feature (e.g. distance between trash racks and traveling screens)? Discuss whether the fish return system on the RMPF was blocked off and was not used at the time of the site audit. Describe the process for fish (and other aquatic species) trapped around the RMPF to be returned to the river, and any circumstances during which the fish return system is not functional.

RESPONSE:

Figure 3.4-9 of the original (construction phase) and Figure 3.4-2 of the original (operations phase) Environmental Report show the configuration of the Reservoir Makeup Pumping Facility (RMPF). As indicated in these figures, the RMPF is equipped with a series of trash racks that span the entire length (or "front") of the RMPF, parallel to river flow, as well as short trash racks that protect the traveling screens from large floating objects and debris entering the structure from upstream or downstream, perpendicular to river flow. As discussed and shown in the original ER(s), fish can enter the RMPF through these trash racks, which have four-inch openings, but can easily escape by swimming downstream parallel to the traveling screens and exiting (through the trash rack) at the downstream end of the structure.

A sluice and discharge line was installed at the traveling screens for the purpose of returning impinged organisms unharmed to the river. After being gently washed from the traveling screens, fish and debris are carried along a sluice which runs the length of the intake structure. Fish are then returned to the river via the sluice and a fish bypass pipe. The point of return is at the downstream end of the intake structure, approximately 0.6 meter (2 feet) below normal water elevation.

The fish return system was blocked off at the time of the NRC audit because of relatively high river flows. When river flows are high, floating debris tends to plug the fish return (a large PVC pipe). During low-flow periods, when salinity in the river exceeds 3 ppt, there is the potential to impinge fish on the RMPF traveling screens. If fish are being impinged on the screens, operations staff are required by procedure to notify the Environmental group and seek guidance on whether the screen wash should be re-routed to the river due to impingement concerns or whether pumping operations should be discontinued. Either serves to mitigate impingement impacts.

CANDIDATE COLA REVISION:

No COLA revision is required as a result of this response.

Question 5.3.1.2-2

QUESTION:

Describe the process for calculating the maximum design approach velocity at the traveling screens on the RMPF for four units and provide the results of the calculations.

Full Text (Supporting Information):

Section 5.3.1.2.1 describes the maximum design approach velocity of the water for the original design, for 2 units and for 4 units. However, the approach velocities are cited as 0.5 fps, 0.55 fps and 0.50 fps. Describe the process for calculating the maximum design approach velocity at the traveling screens on the RMPF for four units. Provide all the data used to calculate the velocity of the water at a screen.

RESPONSE:

Section 5.3.1.2.1 of the ER contains the following description of the River Makeup Pumping Facility (RMPF):

> "As discussed earlier, the RMPF was intended to provide makeup to the MCR for four nuclear units. Thus, the intake for STP 3 & 4 was an integral part of the original design.
>
> The RMPF has a maximum design approach velocity at the traveling screens of 0.5 fps based on a maximum pumping rate of approximately 538,000 gpm, and at the time of construction, this represented the Best Technology Available (Reference 5.3-3). It should be noted that in their Final Environmental Statement for Construction of STP 1 & 2, the NRC calculated a slightly higher maximum approach velocity, 0.55 fps (Reference 5.3-4). The pump station was designed to house eight pumps, with a total pumping capacity of 1200 cfs (538,596 gpm) (Reference 5.3-5). However, the site is able to maintain water levels in the MCR using half of the full complement of pumps (two 107,719-gpm pumps and two 26,930-gpm pumps). The current maximum pumping rate, based on Annual Water Use Reports for 2001 through 2006 submitted by STPNOC to the TCEQ, is 600 cfs, (269,298 gpm) (References 5.3-6, 5.3-7, 5.3-8, 5.3-9, 5.3-10, and 5.3-11). To supply sufficient water to the MCR for four operating units, it would be necessary to complete the pump installation with adequately sized pumps, restoring the original design pumping capacity of 1200 cfs (538,596 gpm). The design approach velocity of 0.50 fps was based on this pumping rate and is not expected to change appreciably with four units in operation."

It should be pointed out that eight pumps were originally installed in the RMPF. When it became clear that that the water level in the MCR could be maintained with half the pumping capacity, four pumps and their associated traveling screens were taken out of service.

Houston Lighting & Power Company (HL&P) was responsible for the design, engineering, licensing, construction, startup and initial operation of the South Texas Project. HL&P engineers calculated the maximum approach velocity (0.5 ft/sec) at the face of the RMPF based on the design dimensions of the intake structure and design intake flows, a straightforward engineering calculation. These calculations would have been provided to NRC staff at the time the original license application was prepared. NRC staff, apparently employing slightly different assumptions, calculated a maximum approach velocity of 0.55 ft/sec. Both the Houston Lighting & Power and the NRC calculations assumed pumping rates of 1,200 cfs/538,600 gpm, which represents the full complement of makeup pumps pumping at design capacity and is twice the current operational pumping rate. The difference between 0.50 and 0.55 ft/sec is small, and ecologically insignificant.

An examination of swimming performance of fishes found in the vicinity of the STP site suggests that most healthy adult and juvenile fish would not be susceptible to impingement. Even some of the species that would seem most at risk are capable, under normal circumstances, of escaping design intake flows. For example, a review of the fisheries literature shows that even fragile, smaller-bodied species such as anchovies, silversides, and mosquitofish, which are common in the Colorado River in the vicinity of STP, are capable of burst speeds that are three to five times the design approach velocity of the RMPF.

CANDIDATE COLA REVISION:

No COLA revision is required as a result of this response.

Question 5.3.2-2

QUESTION:

How will water discharged at outfall 001 be evaluated and compliance with TCEQ permit # WQ0001908000 be determined?

Full Text (Supporting Information):

Discuss the conditions in which chemical impacts are considered SMALL associated with permit criteria. Where will temperature and water quality be measured in the water that is to be discharged into the Colorado River?

RESPONSE:

Outfall 001 effluent will presumably be sampled, per the existing TPDES permit, "at a point in the blowdown line prior to entering the Colorado River." Sampling results will be compared to effluent limitations established by TCEQ to determine permit compliance. Because effluent limitations are based on "segment-specific" water quality standards (as codified by rule in the Texas Administrative Code, Title 30, Chapter 307), they are assumed to be protective of human health and aquatic life. These state water quality standards are in turn based, in large measure, on federal water quality criteria, which are intended to "...accurately reflect the latest scientific knowledge...on the kind and extent of all identifiable effects on health and welfare including, but not limited to, plankton, fish shellfish, wildlife, plant life, shorelines, beaches, aesthetics, and recreation which may be expected from the presence of pollutants in any body of water...and...on the effects of pollutants on biological community diversity, productivity, and stability..." (EPA Gold Book). Because effluent limitations are waterbody-specific and based on rigorous science, it follows that discharges that comply with these limitations are protective of human health and aquatic life and impacts associated with these discharges are SMALL.

The current TPDES permit requires continuous monitoring of Outfall 001 flow and temperature "when discharge occurs." The permit also contains limits for Total Residual Chlorine and pH at Outfall 001. Whole effluent biomonitoring, which takes into account the synergistic effects of effluent constituents and receiving stream water quality characteristics, is the most direct measure of potential toxicity. Biomonitoring of the effluent is required as a condition of the permit to assess potential toxicity. In addition, there is a minimum Colorado River flow threshold that has to be met before discharge from Outfall 001 can commence.

CANDIDATE COLA REVISION:

No COLA revision is required as a result of this response.

Question 5.3.4-2

QUESTION:

Identify the recreational uses within Segment 1401 of the Colorado River and discuss the potential for exposure to thermophilic microorganisms via the thermal plume associated with outfall 001.

Full Text (Supporting Information):

ER Section 5.3.2.1 states that Segment No. 1401 of the Colorado River is designated for contact recreation. Contact recreation is a pathway for risk to public health from thermophilic microorganisms. Describe the recreational activities currently in the river at the vicinity of outfall 001 and the likelihood of exposure to the thermal plume from discharges. Describe the width of the river at outfall 001 and how close the thermal plume would reach to the residents and their docks on the far side of the
river.

RESPONSE:

Segment 1401 is used by fishermen and boaters. Some boaters and owners of riverside houses come in contact with river water through swimming, skiing and other water sports.

The Colorado River is approximately 300 feet wide in the vicinity of Outfall 001. Based on CORMIX modeling, the thermal plume, defined as a 5 degree (F) increase over ambient, could extend all the way across the river in the vicinity of Outfall 001 if discharges occur during periods of low flow.

But the size and configuration of the thermal plume has very little meaning in this context. *Absolute* temperature of the discharge, rather than temperature increase due to facility operations, is what determines whether receiving waters are likely to harbor thermophilic pathogens.

Modeling conducted in support of the STP COL ER predicted that temperatures in the "cold" end (Circulating Water Intake Structure) of the MCR with four units operating would range from around 70°F in December and January to around 96°F in July and August (see Table 3.4.3 of STP COL ER). Temperatures in the "hot" end (Circulating Water Discharge Structure) of the MCR would range from around 86°F in December to 112°F in July and August. Blowdown temperatures would presumably be somewhere in between, as the southern part of the MCR, from which the discharge (Outfall 001) would flow, represents a partially-cooled condition. Regardless, blowdown from the MCR would be controlled to comply with the STP TPDES permit which limits the temperature of the discharge (Outfall 001) to a daily average of 95°F and a daily maximum of 97°F.

Thermophilic microorganisms do not grow at temperatures less than 55°C (131°F) and show optimal growth at 55-65°C (131-140°F) (Sigee 2005). Given that the maximum temperature of the discharge at Outfall 001 would be approximately 97°F, which is well below the temperature at which thermophilic microorganisms grow (131°F) and thrive (131-140°F), the potential for residents of streamside houses or recreational users of the Colorado River to be exposed to thermophilic pathogens appears to be remote.

REFERENCES:

Sigee, D.C. 2005. *Freshwater Microbiology*. John Wiley & Sons, Inc. Hoboken, NJ. Page 87.

CANDIDATE COLA REVISION:

No COLA revision is required as a result of this response.

Question 5.8-1

QUESTION:

Estimate expenditures within the region for materials and services during operation.

Full Text (Supporting Information):

Estimate expenditures within the region for materials and services during operation. Provide qualitative information, if quantitative information is not available, on the order of magnitude, scale, and type of local expenditures that are expected.

RESPONSE:

STPNOC is providing estimated expenditures for the operations period; this information was assessed within the context of Texas, Bay City, and Palacios sales tax revenues for the latest available year. For the purposes of analysis, it was assumed that all expenditures would be subject to taxation by the appropriate taxing entity. Because it is unlikely that 100 percent of the expenditures would occur within Bay City or Palacios, a sensitivity analysis was performed to assess the impacts to each jurisdiction based on the percentage (from 10% to 100%) spent within that jurisdiction. Note that although a complete sensitivity analysis was completed for the City of Palacios, it is not possible that more than a small proportion of materials and services could be purchased within Palacios, because of its limited retail opportunities.

CANDIDATE COLA REVISION:

Section 5.8.2.2.2, Sales and Use Taxes,
The following paragraph is to be added following the last paragraph in this section, and the accompanying table to be inserted as appropriate within the tables for Section 5.8.

STPNOC has estimated annual expenditures for goods and services during operations at $60 million, and estimates that 20%, or $12 million, would be spent locally. To approximate the impact on state and local sales tax revenues, the total was taken as a percentage of increase over the latest year for which actual sales tax revenues were available. It was assumed that none of the items is exempt from sales tax, and that all are subject to Texas sales or use tax. Because of the limited retail opportunities in Bay City and Palacios, a sensitivity analysis was performed to assess the range of impacts from spending 10% to 100% in each jurisdiction. The analysis also addressed the uncertainty regarding private/public ownership of STP 3 & 4 (as noted above, STP 1 & 2 are currently 44% investor-owned and 56% publicly-owned). Only the privately-owned segment is subject to sales tax. Therefore, scenarios for 44%, 60%, 80%, and 100% private ownership were assessed. The analysis is presented in Table 5.8-4.

Depending on the ownership scenario, annual Texas sales tax revenues would range from $1.65 million to $3.75 million, representing an increase over 2006 sales tax revenues of 0.009% and 0.021%, respectively, a SMALL and positive impact.

Annual impacts to Bay City or Palacios tax revenues were estimated to range from a low of $10,590 (44% private ownership with only 10% subject to local taxation) to $240,000 (100% private ownership and 100% spent in either city). (Both cities impose a 2% sales tax, so the potential sales tax revenues are identical.) The associated increases over Bay City's 2005 sales tax revenues ($3.7 million) range from 0.3% to 6.5%, while the increases over Palacios' 2006 sales tax revenues ($219,500) could range from 4.8% to 109.3%. However, because of the limited availability of goods and services, it is unlikely that a major proportion of expenditures would occur in Bay City. At the present time, it is not possible that more than a small proportion of purchases would occur in Palacios, whose population is roughly one-fourth of Bay City's. Based on current retail opportunities, it is likely that impacts to either locale would be positive and SMALL to MODERATE. However, if additional STP suppliers were to locate within either city, sales tax revenue impacts could range from SMALL to LARGE.

Table 5.8-4. Estimated Sales Tax Impacts of Expenditures For Goods & Services During Operation of STP Units 3 & 4

Summary of Estimated Operations Expenditures:					**Estimated Amount**			
Total Annual Expenditures					$60,000,000			
Estimated Proportion Spent Locally					20%			
Estimated Annual Local Expenditures					**$12,000,000**			
Estimated Annual Impacts to Texas Sales Tax Revenues[1]								
State sales tax revenues, 2006[2]					$18,275,209,754			
State sales tax rate[3]					6.25%			
Ownership Scenario:	**44% Private Ownership**		**60% Private Ownership**		**80% Private Ownership**		**100% Private Ownership**	
Assumes 100% of Expenditures Subject To State Tax	**State Sales Tax**	**% of 2006 Sales Tax Revenues**	**State Sales Tax**	**% of 2006 Sales Tax Revenues**	**State Sales Tax**	**% of 2006 Sales Tax Revenues**	**State Sales Tax**	**% of 2006 Sales Tax Revenues**
State Sales Tax	$1,650,000	0.009%	$2,250,000	0.012%	$3,000,000	0.016%	$3,750,000	0.021%
Estimated Annual Impacts to Bay City Sales Tax Revenues[1]								
Bay City sales tax revenues, 2005[4]					$3,681,595			
Bay City sales tax rate[5]					2.0%			
Ownership Scenario:	**44% Private Ownership**		**60% Private Ownership**		**80% Private Ownership**		**100% Private Ownership**	
% of Expenditures Subject to Bay City Sales Tax	**Bay City Sales Tax**	**% of 2005 Sales Tax Revenues**	**Bay City Sales Tax**	**% of 2005 Sales Tax Revenues**	**Bay City Sales Tax**	**% of 2005 Sales Tax Revenues**	**Bay City Sales Tax**	**% of 2005 Sales Tax Revenues**
100.00%	$105,600	2.9%	$144,000	3.9%	$192,000	5.2%	$240,000	6.5%
90.00%	$95,040	2.6%	$129,600	3.5%	$172,800	4.7%	$216,000	5.9%
80.00%	$84,480	2.3%	$115,200	3.1%	$153,600	4.2%	$192,000	5.2%
70.00%	$73,920	2.0%	$100,800	2.7%	$134,400	3.7%	$168,000	4.6%
60.00%	$63,360	1.7%	$86,400	2.3%	$115,200	3.1%	$144,000	3.9%
50.00%	$52,800	1.4%	$72,000	2.0%	$96,000	2.6%	$120,000	3.3%
40.00%	$42,240	1.1%	$57,600	1.6%	$76,800	2.1%	$96,000	2.6%
30.00%	$31,680	0.9%	$43,200	1.2%	$57,600	1.6%	$72,000	2.0%
20.00%	$21,120	0.6%	$28,800	0.8%	$38,400	1.0%	$48,000	1.3%
10.00%	$10,560	0.3%	$14,400	0.4%	$19,200	0.5%	$24,000	0.7%

Estimated Annual Impacts to Palacios Sales Tax Revenues[1]

Palacios sales tax revenues, 2005[6]					$219,500			
Palacios sales tax rate[5]					2.0%			
Ownership Scenario:	**44% Private Ownership**		**60% Private Ownership**		**80% Private Ownership**		**100% Private Ownership**	
% of Expenditures Subject to Palacios Sales Tax	**Palacios Sales Tax**	**% of 2005 Sales Tax Revenues**	**Palacios Sales Tax**	**% of 2005 Sales Tax Revenues**	**Palacios Sales Tax**	**% of 2005 Sales Tax Revenues**	**Palacios Sales Tax**	**% of 2005 Sales Tax Revenues**
100.00%	$105,600	48.1%	$144,000	65.6%	$192,000	87.5%	$240,000	109.3%
90.00%	$95,040	43.3%	$129,600	59.0%	$172,800	78.7%	$216,000	98.4%
80.00%	$84,480	38.5%	$115,200	52.5%	$153,600	70.0%	$192,000	87.5%
70.00%	$73,920	33.7%	$100,800	45.9%	$134,400	61.2%	$168,000	76.5%
60.00%	$63,360	28.9%	$86,400	39.4%	$115,200	52.5%	$144,000	65.6%
50.00%	$52,800	24.1%	$72,000	32.8%	$96,000	43.7%	$120,000	54.7%
40.00%	$42,240	19.2%	$57,600	26.2%	$76,800	35.0%	$96,000	43.7%
30.00%	$31,680	14.4%	$43,200	19.7%	$57,600	26.2%	$72,000	32.8%
20.00%	$21,120	9.6%	$28,800	13.1%	$38,400	17.5%	$48,000	21.9%
10.00%	$10,560	4.8%	$14,400	6.6%	$19,200	8.7%	$24,000	10.9%

1 Note: Assumes that these expenditures are subject to sales tax.
2 Reference 2.5-25
3 Reference 2.5-27
4 Reference 2.5-46
5 Reference 2.5-30
6 Reference 2.5-109 [City of Palacios 2007-2008 Annual Budget, Approved 09/18/2007.

Question 5.8-2

QUESTION:

Estimate tax yields during operations.

Full Text (Supporting Information):

Base tax revenue yields on current ownership percentages. Using whatever reasonable assumptions are necessary, provide quantitative estimates of tax yields during operations.

RESPONSE:

Sales tax impacts were addressed in the response to RAI 5.8-1. Because of Texas wealth equalization policies, impacts to the Palacios Independent School District would change only slightly as a result in differences in ownership. Therefore, this response considers only impacts to Matagorda County and the special districts receiving STP property tax payments.

CANDIDATE COLA REVISION:

Section 5.8.2.2.2, Property Taxes — Counties and Special Districts, modifications to Paragraphs 2 and 3:

During the operation period for STP 3 & 4, the plant owners subject to taxation would pay additional property taxes to Matagorda County, the Matagorda County Hospital District, Navigation District #1, Drainage District #3, ~~and~~ the Palacios Seawall District, and the Coastal Plains Groundwater District (see Table 2.5.2.3-15) based on the appraised valuation. ~~Although the amount of these payments is unknown at this time, it is likely that such payments would provide a MODERATE to LARGE positive impact to those taxing jurisdictions and to the local economy.~~

These property tax payments would be one ~~One~~ of the main sources of economic impact related to the operation of STP 3 & 4.~~new units would be property taxes assessed on the facility.~~ Currently, tax payments on STP 1 & 2 's ~~tax payments~~ represent approximately 75% of the total property taxes received by Matagorda County (see Table 2.5-14). Property taxes to be paid by the owners for STP 3 & 4 during operations would depend on many factors, including millage rates, the percent ownership of each co-owner, and the co-owner's taxable status. Therefore, the valuation amount, and actual taxes that would be paid, cannot be determined at this time. In order to estimate the magnitude of impact on Matagorda County property tax revenues, however, ownership scenarios were used to estimate tax payments. These estimates are based on the assumption that STP 3 & 4 would be assessed at a similar value to STP 1 & 2. Table 5.8-5 presents the results of this analysis, which reveals that property tax revenues for Matagorda

County and the affected special districts would increase substantially over 2006 total levies, from 25.6% (Coastal Plains Groundwater District, under the 44% ownership scenario), to 188% (Palacios Seawall District, under the 100% ownership scenario). It is likely that over the coming years, tax collections unrelated to STP could increase. In this case, the impacts shown in this analysis could be overstated. Other factors would also affect the precise amount of impact for the various entities. However, it is highly likely that the tax payments for STP 3 & 4 after the units begin operation would represent a very LARGE and positive impact to all of the taxing entities and to their other taxpayers. ~~However, since the appraised value once STP 3 & 4 operations begin would increase substantially higher than if the project was not undertaken, it is likely that the beneficial impacts to Matagorda County and the special taxing districts would be LARGE.~~

Table 5.8-5. Estimated Operations Impacts to Property Taxes, Matagorda County and Special Districts

Tax Rates and STP Payments by Entity, 2006[1], Based on 44% Private Ownership

Entity	Tax Rates	Total STP Payments	Entity's Total Levy	STP as Percent of Total Levy
Matagorda County	0.26829	$6,100,000	$9,039,485	67.5%
Matagorda County Hospital District	0.17214	$2,567,253	$5,754,692	44.6%
Navigation District #1	0.03758	$342,148	$486,665	70.3%
Drainage District #3	0.02200	$200,299	$242,153	82.7%
Palacios Seawall	0.02528	$230,162	$327,826	70.2%
Coastal Plains Groundwater District	0.00433	$39,422	$153,884	25.6%
Total	0.52962	$9,479,284	$16,004,705	59.2%

Hypothetical Impact Scenarios: STP 3 & 4 Property Tax Assessment, 2015 (Assumption: STP 3 & 4 are valued similarly to STP 1 & 2)

Scenarios:	44% Private Ownership		60% Private Ownership		80% Private Ownership		100% Private Ownership	
Tax Entity	Estimated Payment	% Increase over 2006 Total	Estimated Payment	% Increase over 2006 Total	Estimated Payment	% Increase over 2006 Total	Estimated Payment	% Increase over 2006 Total
Matagorda County	$6,100,000	67.5%	$8,318,182	92.0%	$11,090,909	122.7%	$13,863,636	153.4%
Matagorda County Hospital District	$2,567,253	44.6%	$3,500,800	60.8%	$4,667,733	81.1%	$5,834,666	101.4%
Navigation District #1	$342,148	70.3%	$466,565	95.9%	$622,087	127.8%	$777,609	159.8%
Drainage District #3	$200,299	82.7%	$273,135	112.8%	$364,180	150.4%	$455,225	188.0%
Palacios Seawall	$230,162	70.2%	$313,857	95.7%	$418,476	127.7%	$523,095	159.6%
Coastal Plains Groundwater District	$39,422	25.6%	$53,757	34.9%	$71,676	46.6%	$89,595	58.2%
Total	$9,479,284	59.2%	$12,926,296	80.8%	$17,235,062	107.7%	$21,543,827	134.6%

[1] Reference 2.5-39.

Question 5.8-3

QUESTION:

Estimate maximum road congestion during operations.

Full Text (Supporting Information):

As with section 4.4.2, reconcile trip data for plant workers, outage workers, and general public, focusing on peak hour usage of FM 521 in particular.

RESPONSE:

4073 = (Average Annual Daily Traffic) AADT count, total current traffic (including STP and non-plant related traffic)
1365 = current STP workers
2021 = STP workers after 3 & 4 (1062 + 959)
959 = new operations workers
2000 = outage workers
1949 = non-plant related traffic, local traffic
4042 = total STP traffic count for 24-hour period (2124 + 1918)
1918 = New operations workers daily traffic
1637 = 81% of STP workforce (day + night shift)
1172 = 58% of STP workforce (day shift)
465 = 23% of STP workforce (night shift)

CALCULATIONS
AADT:
4073 + 1918 = 5991 vehicles in 24-hr period (AADT with new operations workforce traffic included)
Current AADT
4073/2730 = 67%
New AADT
5991/4042 = 67% of AADT traffic from STP
5991/1949 = 33% of AADT traffic from non-plant related vehicles

Peak Time (10% of AADT on road during peak hour):
-195 (non-plant related traffic, local traffic) (10% of 1343)
-1172 (day workers leaving) (58% of 2021)
-465 (night workers arriving) (23% of 2021)
=1832 total vehicles during day/night shift change *, **

Maximum Threshold for FM 521= 5520 at Peak Hour (10% of 55,200)

* outage workers are not included because they will be on 12.5 hour shifts and will not be changing crews at this time of day.
** contractors and truck deliveries would be required to arrive and depart at alternate times than shift change to alleviate traffic congestion, and thus are not factored into the above analysis.

CANDIDATE COLA REVISION:

Section 5.8.2.2.4, Page 5.8-15, paragraphs 4, 5 and 7.

For purposes of analysis it is assumed that ~~100%~~ 67% of the 4073 vehicles are attributable to the current STP 1 & 2 workforce.

Operations workers are on a 35-day rotation. On any given day, 58% of the total operations workforce will be on the day shift or in training, 23% will be on the night shift, and 19% will be off (Reference 5.8-9). After conservatively assuming that ~~all~~ 67% of the traffic is due to STP workers, it is assumed that ~~all~~ the majority of the traffic on FM 521 would occur during shift change (5:30 a.m.— 7:00 a.m. and 5:30 p.m.—7:00 p.m.). The night-to-day shift change (totaling 58% of the operations workforce) will result in the highest traffic count as approximately ~~1262~~ 1172 day-shift workers arrive and ~~500~~ 465 night-shift workers leave. However, the arrival and departure times for workers will vary over a 1.5-hour time period, alleviating some congestion at the site entrance.

FM 521 has a functional class designation of two-lane, undivided, rural major collector, ~~is load zoned to 58,420 gross pounds~~, so there is enough capacity for ~~31,200~~ 55,200 passenger cars or equivalent to ~~1130~~ 2130 passenger cars beyond the current 170-cars-per-hour use now. STP 3 & 4 operations will increase the existing STP workforce by ~~888~~ ~~810~~ 959 onsite workers divided into two shifts. It is assumed that the number of new operations workers per shift will be similar, in percentage, to the current operations workforce. Therefore, during the day-shift change, approximately 58% of the total ~~2253~~ ~~2175~~ 2021(~~1365~~ 1062 current workers and ~~888~~ ~~810~~ 959 new workers) operations workers will leave the STP site while 23% will arrive, as well as ~~134~~ 195 (10% of the total ~~1343~~ 1949 non-plant related traffic) non-plant related vehicles, for a total of ~~1825~~ ~~1896~~ 1832 vehicles during the shift change, ~~above~~ well within the maximum designated capacity of ~~1300~~ 2300 vehicles per hour. STP operations traffic will not exceed road capacity during shift change. There could also be as many as 2000 outage workers per unit (divided between two shifts) for approximately 17-35 days every 18 months. During outages, assuming 1500 to 2000 additional vehicles in a 24-hour period, for two 12.5 hour shifts, the number of vehicles on FM 521 could be ~~153 to 174~~ 300 to 321 vehicles per hour.

Question 5.8-4

QUESTION:

Estimate housing impacts using latest population data.

Full Text (Supporting Information):

As with the corresponding subsection in Section 4.4, use latest housing figures (post-2000 Census), or explain that the 2000 Census data are the latest available.

RESPONSE:

The decennial Census (2000, in this case) does provide the latest detailed data regarding the number, characteristics, and ownership status of housing stock at the county and sub-county level. The decennial Census data are also consistent with population and demographic data used throughout the ER in various analyses. Later housing data from other sources lack the granularity provided by the decennial Census data, and may use a variety of estimation methodologies (and thus may not be comparable across regions or even between neighboring counties). Also, locally provided information may not be completely objective if the provider's goal is to sell real estate, for example, or to promote the local area and attract new firms or residents.

CANDIDATE COLA REVISION:

In the subsections identified below, add the following changes as indicated:

Section 2.5.2.6.1, Paragraph 4:
Table 2.5-25 provides the number of housing units and housing unit vacancies for Matagorda and Brazoria Counties for 1990 and 2000. The2000 Census found 109,239 housing units in Matagorda and Brazoria Counties; the 2000 Census provides the latest consistent and reliable information that is sufficiently detailed for this analysis.

Section 4.4.2.2.6, Construction, Paragraph 3:
In 2000, 5081 vacant housing units were available for sale or rent in Matagorda and Brazoria Counties—3853 were vacant rental units and 1228 were vacant housing units available for sale (Subsection 2.5.2.6.1). The 2000 Census provides the latest consistent and reliable information that is sufficiently detailed for this analysis.

Section 5.8.2.2.6, Paragraph 2:
While there is no way of accurately estimating the number of available housing units at the commencement of operations, Subsection 2.5.2.6 discusses the availability of housing in the region in 2000. The 2000 Census provides the latest consistent and reliable information that is sufficiently detailed for this analysis.

Question 6.3-1

QUESTION:

Describe waste effluent and storm water outfalls that will be added to existing outfalls and the water bodies into which they will discharge.

Full Text (Supporting Information):

Describe waste streams and storm water outfalls that will be added to existing outfalls, including any storm water treatment associated with each that may be required for Units 3 and 4 construction and operation. Also, describe the water bodies into which these outfalls will discharge. Describe the impact and cumulative impacts of the all units' discharge through outfalls into water bodies at and near the site.

RESPONSE:

With the exception of storm water discharges, all STP Units 3 & 4 waste streams would discharge to the Main Cooling Reservoir (MCR) and be discharged from the single MCR outfall when blowdown is required. The operational effluents for Units 3 & 4 and support facilities would be permitted by the Texas Commission on Environmental Quality (TCEQ) and undergo monitoring as required by the state of Texas. Similar requirements can be found for current Units 1 & 2 operational facilities' outfalls to the MCR.

STPNOC and its construction contractor will prepare a Storm Water Pollution Prevention Plan (SWPPP). The SWPPP has yet to be completed. Therefore, no storm water discharge locations have been finalized for Units 3 & 4 construction or operation activities. However, because the proposed units will be located in an area that currently is covered by a SWPPP, the potential receiving surface drainage features would be the same as those for Units 1 & 2 and are described in RAI Response 2.3-2, and ER Sections 4.2 and 5.2.

CANDIDATE COLA REVISION:

No COLA revision is required as a result of this response.

Question 6.3-2

QUESTION:

Provide information regarding the anticipated operational monitoring deriving from the NRC 10 CFR 20.1406 initiative and the Nuclear Energy Institute program.

Full Text (Supporting Information):

While the program initiated with the Nuclear Energy Institute (NEI) is mentioned in the section on Existing Hydrological Monitoring, no mention is made of it under Operational Monitoring. Provide information regarding the anticipated operational monitoring derived from the NEI program. If not available, provide an overview of operational monitoring objectives and consistency with the NRC 10 CFR 20.1406 initiative and the NEI program.

RESPONSE:

In 2006, the Nuclear Energy Institute (NEI) sponsored a task force to establish consistent methods to monitor and report radionuclides in groundwater. The South Texas Project Units 1 & 2 has participated in the NEI Groundwater Protection Initiative and is in the process of implementing the Electric Power Research Institute Guidelines for Groundwater Protection. Tritium in the shallow aquifer is expected as a result of the Main Cooling Reservoir design.

STPNOC anticipates continuing its groundwater monitoring program during the operations of Units 3 & 4.

CANDIDATE COLA REVISION:

No COLA revision is required as a result of this response.

Question 7.1-1

QUESTION:

Provide the source of the dose factors used in evaluation of each design basis accident.

Full Text (Supporting Information):

Tables 7.1-1 through 7.1-6 of the ER present isotopic release rates for ABWR design basis accidents. Doses calculated from the isotopic release rates are not consistent with the doses listed Tables 7.1-8 through 7.1-14, which are summarized in Table 7.1-15. The differences appear to be associated with dose factors. The ABWR DCD lists 3 sets of dose factors. Provide the source of the dose factors used for each DBA.

RESPONSE:

The ER doses are based on the doses in the certified DCD. Doses in the ER are calculated by multiplying the DCD doses by the ratio of the site X/Q to the DCD X/Q.

As indicated in the RAI, the ABWR DCD refers to three different sources for the dose conversion factors (DCFs) without clear indication of which source is used for any particular DCFs. From a review of the activity releases and doses reported in the DCD, the thyroid doses are based on the DCFs from ICRP 30 and the whole body doses are based on the average gamma disintegration energies from General Electric document NEDO-21143-1, "Radiological Accident Evaluation – The CONAC03 Code," December 1981. The DCFs from Regulatory Guide 1.109, although referenced in the DCD, do not appear to have been used in the calculation of the accident doses that are presented in the DCD.

CANDIDATE COLA REVISION:

Although Table 7.1-8 of the ER lists the EAB dose for the instrument line break as being a 0-2 hour dose, the doses reported in DCD Table 15.6-3 are for the 8 hour duration of the accident. Table 7.1-8 of the ER will be revised as shown to make it clear that the dose is based on the 0-8 hour releases.

Table 7.1-8 Doses for Failure of Small Lines Carrying Primary Coolant Outside Containment

Location	Time (hr)	DCD Dose (Sv)		χ/Q Ratio (Site/DCD)	Site Dose (rem)	
		Whole Body	Thyroid		Whole Body	Thyroid
EAB	0-2 0-8	9.4E-04	4.8E-02	3.07E-02	2.9E-03	1.5E-01
LPZ	0-8	9.4E-04	4.8E-02	2.58E-03	2.4E-04	1.2E-02
	8-24					
	24-96					
	96-720					
	Total				**2.4E-04**	**1.2E-02**
Regulatory Limit (NUREG-0800, Subsection 15.6.2)					2.5	30

Note:
DCD doses are from the ABWR DCD (Reference 7.1-1, Table 15.6-3).

The DCD does not provide LPZ 0-2 hr doses. The site LPZ EAB doses are obtained by multiplying the DCD EAB 0-8 hr doses by the ratio of LPZ the site EAB χ/Q to DCD EAB χ/Q.

Question 7.1-2

QUESTION:

Provide correct EAB and LPZ dose estimates for the Clean Up Water Line Break Outside Containment DBA in Table 7.1-12.

Full Text (Supporting Information):

Table 7.1-12 lists the estimated whole body and thyroid doses for this accident. In the table, the whole body and thyroid doses at each distance are identical. Table 7.1-8 lists the estimated doses for the Failure of Small Lines Carrying Primary Coolant Outside Containment DBA which involves the same set of isotopes. There is about a factor of 50 difference in the whole body and thyroid doses in Table 7.1-8. Reconcile which of the doses in Table 7.1-12 is in error. Comparison with other whole body and thyroid doses in Table 7.1-15 indicates that this error exists elsewhere.

RESPONSE:

The cleanup water line break doses in Environmental Report (ER) Table 7.1-12 are calculated by multiplying the dose in DCD Table 15.6-18 associated with an atmospheric dispersion factor (X/Q) of 1.37E-3 s/m^3 by the ratio of the actual site X/Q to the DCD X/Q value of 1.37E-3 s/m^3. For this DCD X/Q value, the whole body and thyroid doses are the same in DCD Table 15.6-18. This is clearly in error. DCD Table 15.6-18 shows doses based on four different X/Q values:

Meteorology (s/m^3)	Thyroid Dose (Sv)	Whole Body Dose (Sv)
2.29E-02	3.0E-1	2.8E-3
1.37E-03	1.7E-4	1.7E-4
1.18E-03	1.5E-4	1.5E-4
2.19E-04	2.7E-5	2.7E-5

For the dispersion factor of 2.29E-02 sec/m^3 the thyroid dose is about a factor of 100 greater than the whole body dose; this ratio of thyroid to whole body is consistent with the doses for Instrument Line Break in DCD Table 15.6-3, an accident similar to Cleanup Line Break. For the other dispersion factors shown in DCD Table 15.6-18, the whole body doses change proportional to the X/Q values, as would be expected; however, the thyroid doses were not changed consistent with the changes in the dispersion factor. DCD Table 15.6-18 will be corrected and ER Table 7.1-12 will be revised based on the ratio of the site X/Q to the DCD X/Q. Based on the activity releases reported in DCD Table 15.6-17, the corrected values for DCD Table 15.6-18 are:

Meteorology (s/m^3)	Thyroid Dose (Sv)	Whole Body Dose (Sv)
2.29E-02	3.0E-1	2.8E-3
1.37E-03	~~1.7E-4~~1.8E-2	1.7E-4
1.18E-03	~~1.5E-4~~1.5E-2	1.5E-4
2.19E-04	~~2.7E-5~~2.8E-3	2.7E-5

CANDIDATE COLA REVISION:

Tables 7.1-12, 7.1-14 and 7.1-15 of the ER will be revised as shown:

Table 7.1-12 Doses for Cleanup Water Line Break Outside Containment

Location	Time (hr)	DCD Dose (Sv)		χ/Q Ratio (Site/DCD)	Site Dose (rem)	
		Whole Body	Thyroid		WholeBody	Thyroid
EAB	0-2	1.7E-04	~~4.7E-02~~ 1.8E-02	3.07E-02	6.2E-04	~~5.2E-04~~ 5.5E-02
LPZ	0-8			2.58E-03	4.4E-05	~~4.4E-05~~ 4.6E-03
	8-24					
	24-96					
	96-720					
	Total				**2.4E-04**	**~~4.4E-05~~ 4.6E-03**
Regulatory Limit (10 CFR 100.11)					25	300

Notes:

DCD doses are from the ABWR DCD (Reference 7.1-1, Table 15.6-18).

The DCD does not provide LPZ doses. The site LPZ doses are obtained by multiplying the DCD EAB doses by the ratio of LPZ χ/Q to DCD EAB χ/Q.

Table 7.1-14 Summary of Design Basis Accident EAB Doses

DCD Section	Accident	Site Dose (rem)			Dose Limit (rem)	
		Whole Body	Thyroid	TEDE	Whole Body	Thyroid
15.6.2	Failure of Small Lines Carrying Primary Coolant Outside Containment	2.9E-03	1.5E-01	7.3E-03	2.5	30
15.6.4	Main Steam Line Break	-	-	-	-	-
	Preexisting Iodine Spike	4.0E-02	1.6E+00	8.7E-02	25	300
	Equilibrium Iodine Activity	1.9E-03	8.0E-02	4.3E-03	2.5	30
15.6.5	Loss-of-Coolant Accident	1.3E-01	5.8E+00	3.0E-01	25	300
None	Cleanup Water Line Break Outside Containment	5.2E-04	~~5.2E-04~~ 5.5E-02	~~5.4E-04~~ 2.2E-03	25	300
15.7.4	Fuel-Handling Accident	3.7E-02	2.3E+00	1.1E-01	6	75

Notes:
The site doses and dose limits are taken from Tables 7.1-8 to 7.1-13.

The dose limits are from either NUREG-0800 or 10 CFR 100.11, as indicated in Tables 7.1-8 to 7.1-13.

Preexisting Iodine Spike and Equilibrium Iodine Activity are subsets of Main Steam Line Break.
All accidents meet the 10 CFR 50.34(a)(1)(ii) dose limit of 25 rem TEDE.

Table 7.1-15 Summary of Design Basis Accident LPZ Doses

DCD Section	Accident	Site Dose (rem)			Dose Limit (rem)	
		Whole Body	Thyroid	TEDE	Whole Body	Thyroid
15.6.2	Failure of Small Lines Carrying Primary Coolant Outside Containment	2.4E-04	1.2E-02	6.1E-04	2.5	30
15.6.4	Main Steam Line Break	-	-	-	-	-
	Preexisting Iodine Spike	3.4E-03	1.3E-01	7.3E-03	25	300
	Equilibrium Iodine Activity	1.6E-04	6.7E-03	3.6E-04	2.5	30
15.6.5	Loss-of-Coolant Accident	2.7E-01	2.5E+01	1.0E+00	25	300
None	Cleanup Water Line Break Outside Containment	4.4E-05	~~4.4E-05~~ 4.6E-03	~~4.5E-05~~ 1.8E-04	25	300
15.7.4	Fuel Handling Accident	3.1E-03	1.9E-01	8.9E-03	6	75

Notes:
The site doses and dose limits are taken from Tables 7.1-8 to 7.1-13.

The dose limits are from either NUREG-0800 or 10 CFR 100.11, as indicated in Tables 7.1-8 to 7.1-13.

Preexisting Iodine Spike and Equilibrium Iodine Activity are subsets of Main Steam Line Break.

All accidents meet the 10 CFR 50.34(a)(1)(ii) dose limit of 25 rem TEDE.

Question 9.3.2-2

QUESTION:

Provide the documentation that supports the statements and conclusions used in Section 9.3 on terrestrial resources at the Allen's Creek site.

Full Text (Supporting Information):

Section 9.3.2.2.4 states that the impacts to terrestrial resources at the Allen's Creek site "would be SMALL, similar to those at the proposed STP site." Based on the use of readily available information (e.g., GIS layers describing the habitats and vegetation of Texas or national land cover datasets), and assuming the same footprint as the STP site, respond to the following associated requests: (1) Identify the extent and acreage of the hardwood riparian and forested lands that would likely be impacted. (2) Identify the acreage of open cropland and pasture that would likely be impacted. (3) Identify any wetlands on the site that would likely be impacted and the proportion or acreage of wetlands contained within the construction area footprint. (4) Identify the potential ROWs for transmission corridors. (5) Provide information available concerning potential routes and the species/habitats and wetlands that might be affected by new transmission line construction.

RESPONSE:

1. *Identify the extent and acreage of the hardwood riparian and forested lands that would likely be impacted.*

Allen's Creek is located primarily within cropland areas (TPWD 2008, USFWS 2008). It is not anticipated that construction of the plant would affect any hardwood riparian and forested lands. Approximately 10 % of the area is wooded.

2. *Identify the acreage of open cropland and pasture that would likely be impacted.*
The Allen's Creek Site is approximately 3,000 acres. According to Section 4.1 of the ER, approximately 770 acres may be disturbed as a result of construction of the plant. STPNOC assumes that the same approximate acreage would be disturbed for construction at Allen's Creek. 90 acres would be permanently dedicated to the facility layout. The remaining 610 acres would be returned to grassland. STPNOC does not anticipate that it would develop the proposed Allen's Creek reservoir for a cooling water source.

3. *Identify any wetlands on the site that would likely be impacted and the proportion or acreage of wetlands contained within the construction area footprint.*

Some minor and emergent wetlands are noted on the western edge of the Allen's Creek site (USFWS 2008). Some minor "ponds" are located along Allen's Creek. Many of the areas identified are less than an acre, and STPNOC estimates that less than 5% of the entire site is

occupied by identified wetlands. STPNOC assumes that the construction area footprint would not significantly affect the areas identified by the inventory.

4. *Identify the potential ROWs for transmission corridors..*

Because ERCOT manages the construction and routing of transmission corridors in this area, STPNOC cannot verify the location of transmission corridors from the Allen's Creek Site. However, new ROWs would be required. STPNOC anticipates that the corridors would be approximately 150 to 200 ft. wide, and would run 30 miles east to Parrish (to the southeast) and O'Brien (to the northeast) substations in Fort Bend County (Siemens 2007).

5. *Provide information available concerning potential routes and the species/habitats and wetlands that might be affected by new transmission line construction.*

Potential routes for the transmission lines would run from the site in southern Austin County northeast to the O'Brien substation near Houston and southeast to the W.A. Parish substation (Siemens 2007). Both substations are in Fort Bend County. The area through which the corridors could pass is primarily cropland and rangeland (USFWS 2008, USGS 2008). STPNOC noted some potential wetland impacts, since the corridors may cross riparian areas. (USGS 2008). Species of potential concern for Fort Bend and Austin counties are noted in the response to RAI 09.03.02-04.

REFERENCES:

TPWD 2008. Texas Parks and Wildlife Department, *Vegetation Types of Texas 1984*. Available at: http://www.tpwd.state.tx.us/landwater/land/maps/gis/map_downloads/map_gallery/bio/. Accessed June 13, 2008.

Siemens 2007. Siemens, *Memorandum to Peter Wybierlala: Preliminary Results of Analyzing Transmission Capabilities for a Nuclear Power Plant in Texas*. May 31, 2007.

USGS 2008. U.S. Geological Society, *Map Studio* 2008. Available at: http://gisdata.usgs.net/website/Map%5FStudio/viewer.php. Accessed June 13, 2008

USFWS 2008. United States Fish and Wildlife Service, *Weltands Online Mapper*. Available at http://wetlandsfws.er.usgs.gov/wtlnds/launch.html. Accessed June 13, 2008.

CANDIDATE COLA REVISION:

Changes to the COLA Revision 1.0 will be made and provided as an update in COLA Revision 2.0. Text that is changed from Revision 1.0 is highlighted with gray shading. Clarifying text is provided immediately following the proposed change.

The final paragraph of section 9.3.2.2.4 is changed as follows:

Impacts to terrestrial resources at the Allen's Creek site would be SMALL, similar to or greater than the impacts described in section 4.3.1 of this ER., ~~at the proposed STP site, because the short length of the potential transmission corridor and current agricultural use will limit any adverse impacts on sensitive species~~. Construction activities should not reduce local biodiversity or impact threatened or endangered species. Potential impacts of construction on wetlands would be negligible. STPNOC assumes that impacts of additional transmission corridors on terrestrial species and potential wetlands within corridors would also be SMALL. Any adverse impacts, either at the site or within transmission corridors, would be short-term .

Question 9.3.2-3

QUESTION:

Provide the documentation that supports the statements and conclusions used in Section 9.3 on terrestrial resources at the Malakoff site.

Full Text (Supporting Information):

Section 9.3.2.3.4 states that the terrestrial resources at the Malakoff site "would be similar to or greater than those at the proposed STP site." Based on the use of readily available information (e.g., GIS layers describing the habitats and vegetation of Texas or national land cover datasets), and assuming the same footprint as the STP site, respond to the following associated requests: (1) Identify the estimated acreages of agricultural cropland, wetlands, pasture, hardwood forest, and/or riparian bottomland forests on the site that might be affected by proposed construction activities. (2) Identify the potential ROWs for transmission corridors. (3) Provide information concerning potential routes and the species/habitats and wetlands that might be affected by new transmission line construction.

RESPONSE:

1. *Identify the estimated acreages of agricultural cropland, wetlands, pasture, hardwood forest, and/or riparian bottomland forests on the site that might be affected by proposed construction activities.*

The majority of the Malakoff site is cropland and rangeland (TPWD 2008). As noted in section 4.1, approximately 770 acres of the site will be affected by construction, and 90 acres will permanently affected for operation of completed facility. STPNOC estimates that 80% of the agricultural use will be affected by construction while the remaining portion of the construction site will affect a mixed forest area. There are no wetlands or bottomlands on the property (USGS 2008).

2. *Identify the potential ROWs for transmission corridors.*

Because ERCOT will develop any potential ROWs, STPNOC cannot predict where those ROWs will be located. A new ROW could extend approximately one mile from the site to Trinidad substation in Henderson County to join the grid. Existing corridors would be used to develop additional lines beyond Trinidad (Siemens 2007). These lines may potentially lead to the Richland and Big Brown substations in the south in Navarro and Freestone counties, respectively. Another line could run from Trinidad north to Tricorner and Watermill substations, in Dallas County.

3. *Provide information concerning potential routes and the species/habitats and wetlands that might be affected by new transmission line construction.*

Potential routes could run along the southwest portion of the site and join the substation in Trinidad. The corridor would not exceed 200 yards. Possible routes from the site to Trinidad Substation may include wetlands identified on U.S. Geological Survey land cover maps (USGS 2008). Important species within Henderson County are described in the answer to RAI 09.03.02.04. The existing route from Trinidad north to Tricorner and Watermill could include runs through Kaufman County (Google Earth 2008). Species and habitats are described in Table 1 to this RAI response. However, land use and habitats in the area of the ROW are designated as hay and cropland in USGS land cover maps (USGS 2008; Google Earth 2008). Some wetland habitats may be present where the line crosses riparian zones. It is expected that any impacts on habitat or species will be short term during construction of any new ROWs.

The southern route could run from Trinidad to Richland and Big Brown substations (Seimens 2007). The ROW runs through Navarro and Freestone Counties. RAI response 09.03.02-04 provides a listing of species within Freestone Counties. Species identified in Navarro County are described in Table 2 of this RAI response. The corridor crosses through open cropland and some forest from Trinidad to Big Brown (Google Earth 2008; USGS 2008). STPNOC does not anticipate that important habitats or wetland areas would be adversely affected.

REFERENCES:

TPWD 2008. Texas Parks and Wildlife Department, *Vegetation Types of Texas 1984*. Available at: http://www.tpwd.state.tx.us/landwater/land/maps/gis/map_downloads/map_gallery/bio/ Accessed June 13, 2008.

Siemens 2007. Siemens, *Memorandum to Peter Wybierlala: Preliminary Results of Analyzing Transmission Capabilities for a Nuclear Power Plant in Texas*. May 31, 2007.

USGS 2008. U.S. Geological Society, *Map Studio* 2008. Available at: http://gisdata.usgs.net/website/Map%5FStudio/viewer.php. Accessed June 13, 2008.

CANDIDATE COLA REVISION:

The final paragraph of section 9.3.2.2.4 is changed as follows:

Impacts to terrestrial resources at the Malakoff site would be SMALL, similar to or greater than the impacts described in section 4.3.1 of this ER.~~, at the proposed STP site, because the short length of the potential transmission corridor and current agricultural use will limit any adverse impacts on sensitive species~~. Construction activities should not reduce local biodiversity or impact threatened or endangered species. Potential impacts of construction on wetlands would be negligible. STPNOC assumes that impacts of additional transmission corridors on terrestrial species and potential wetlands within those corridors would also be SMALL. Any adverse impacts, either at the site or within transmission corridors, would be short-term.

TABLE 1
Protected Species in Kaufman County (TPWD 2008a)

Common Name	Scientific Name	Federal Status	State Status
Birds			
American Peregrine Falcon	*Falco peregrinus anatum*	DL	E
Arctic Peregrine Falcon	*Falco peregrinus tundrius*	DL	T
Bald Eagle	*Haliaeetus leucocephalus*	DL	T
Interior Least Tern	*Sterna antillarum athalassos*	E	E
Peregrine Falcon	*Falco peregrinus*	DL	E, T
Piping Plover	*Charadrius melodus*	T	T
White-faced Ibis	*Plegadis chihi*		T
Whooping Crane	*Grus americana*	E	E
Wood Stork	*Mycteria americana*		T
Mammals			
Red wolf	*Canis rufus*	E	E
Reptiles			
Alligator snapping turtle	*Macrochelys temminckii*		T
Texas horned lizard	*Phrynosoma cornutum*		T
Timber/Canebrake rattlesnake	*Crotalus horridus*		T

E = Endangered; T = Threatened; C = Candidate; DL = Delisted; Blank = Not listed.

TABLE 2 Protected Species in Navarro County (TPWD 2008a)			
Common Name	**Scientific Name**	**Federal Status**	**State Status**
Birds			
American Peregrine Falcon	*Falco peregrinus anatum*	DL	E
Arctic Peregrine Falcon	*Falco peregrinus tundrius*	DL	T
Bald Eagle	*Haliaeetus leucocephalus*	DL	T
Interior Least Tern	*Sterna antillarum athalassos*	E	E
Peregrine Falcon	*Falco peregrinus*	DL	E, T
Piping Plover	*Charadrius melodus*	T	T
White-faced Ibis	*Plegadis chihi*		T
Whooping Crane	*Grus americana*	E	E
Wood Stork	*Mycteria americana*		T
Mammals			
Red wolf	*Canis rufus*	E	E
Reptiles			
Alligator snapping turtle	*Macrochelys temminckii*		T
Texas horned lizard	*Phrynosoma cornutum*		T
Timber/Canebrake rattlesnake	*Crotalus horridus*		T
E = Endangered; T = Threatened; C = Candidate; DL = Delisted; Blank = Not listed.			

Question 9.3-1

QUESTION:

Explain how the Limestone alternative site satisfies NRC's siting criteria for candidate sites. The revision to ESRP 9.3 (p. 9.3-2) issued for use by the NRC staff and for public comment calls for candidate sites "to be among the best that can reasonably be found for the siting of a nuclear power plant." Similar language is at p. 9.3-1 of the original version of ESRP 9.3.

Full Text (Supporting Information):

Section 9.2.1 of Regulatory Guide 4.2 Rev. 2 states that candidate sites must be realistic siting options, potentially licensable, and capable of being developed. The information in the ER superimposed the location of nuclear units upon the existing Limestone, Units 1 and 2; since Units 1 and 2 are not expected to be retired, identify where prospective nuclear units could be located on the Limestone site. The staff learned on their visit to the Limestone site that (1) NRG's proposed coal-fired unit 3 at Limestone will use dry cooling because insufficient water is available for wet cooling, (2) any new nuclear units sited at the Limestone site would also likely need to use dry cooling resulting in a significant economic penalty in comparison to the STP site, and (3) NRG does not own the mineral rights at the Limestone site and natural gas production wells. Natural gas exploration and production activities at the site may make siting new nuclear units at the site problematic for safety reasons. Explain how the Limestone site satisfies the ESRP 9.3 and Regulatory Guide 4.2 Rev. 2 siting criteria for candidate sites given the land availability, water limitations and ongoing natural gas exploration and production activities at the site.

RESPONSE:

STPNOC will answer the RAI in several parts.

1. *Location of ABWR units on the Limestone site*

   The ER does not specify the location of the ABWR units on the Limestone site. A photograph informally presented to the Staff during a site visit, and marked "PROPRIETARY", erroneously depicted the ABWR units directly over the Limestone coal-fired facility. During its assessment of the Limestone site, STPNOC assumed that the ABWR units would be placed on the undeveloped area east of the Limestone coal-fired power plant. This area is located in Freestone County, and is more fully described in the STPNOC's response to RAI 09.03.02-01.

2. *Availability of cooling water*

   In assessing the environmental impacts of ABWR units at the Limestone site, STPNOC assumed that the ABWR would be sited there instead of a third coal-fired plant.

Using the guidance provided in NUREG-1555 9.3, STPNOC reviewed only the environmental impacts of the ABWR units at the Limestone site. In doing so, it assumed that sufficient water could be purchased and developed for cooling at the site. In Texas, the availability of water generally depends on the willingness of a developer to purchase water rights from owners within the basin system (TNRCC 2002). Whether water rights would actually be purchased is an inherently economic decision. According to NUREG-1555, the analysis of economic considerations is left for the "obviously superior" portion of the alternatives review. Because we concluded that the Limestone site was not "environmentally preferable," we did not complete an economic analysis of the impacts of purchasing water rights for the site.

3. *Dry cooling technology*

As noted previously, STPNOC assumed that sufficient water could be purchased and developed for cooling at the site, and did not assess alternative cooling technologies in the environmental analysis because economic penalties are identified in the "obviously superior" prong of the alternative analysis. STPNOC did not review mitigating technology strategies for the ABWR units at the Limestone site, considering instead that the environmental impacts of wet cooling would probably provide the most accurate analysis of the alternative site.

STPNOC notes that dry cooling is not necessarily an appropriate alternative cooling technology for ABWR units at this site. Studies reviewing dry cooling for nuclear power plants do not recommend this technology. As the Staff states in the RAI, dry cooling results in a significant economic penalty. Additionally, the operation of dry cooling facilities affects the ability of the plant to generate power; creating economic and socioeconomic effects. Energy penalties are more likely to occur during the hottest part of the day, during the peak times of energy demand. A loss in energy production at the highest period of consumption could also cause a significant reduction in the availability of power on the grid, in addition to the high economic penalty (Micheletti & Burns 2002). Size of the dry cooling facility is also an environmental consideration. One study has shown that a direct dry cooling system occupies a footprint more than two times larger than its wet cooling counterpart (Micheletti & Burns 2002).

4. *Mineral rights at the Limestone site and natural gas production wells*

During its analysis, STPNOC assumed that it could acquire the mineral and natural gas rights to the site if it were to prove necessary to do so. These issues were not identified as issues at the Limestone site, as such an analysis would affect only the cost of the project. Aerial photographs of the site show that the potential area of construction would not be adversely affected by the presence of gas exploration in other portions of the Limestone site.

5. *Explain why Limestone is a good site given the land availability, water limitation and ongoing natural gas exploration and production activities at the site.*

As discussed above, the "limitations" assumed by the Staff do not necessarily affect STPNOC's ability to license the site for the ABWR units. The Limestone site access issues do not affect the environmental or safety impact of constructing the ABWR units at the site. However, Limestone is licensable because (1) water is available at the site, as noted in section 9.3.2.1; and (2) ongoing mineral and gas exploration activities are not in locations where the safety of the site would be affected.

REFERENCES:

TNRCC 2002. Texas Natural Resource Conservation Commission "Rights to Surface Water in Texas," Document No. GI-228. May 2002. Available at http://www.tceq.state.tx.us/comm_exec/forms_pubs/pubs/gi/gi-228.html. Accessed July 11, 2008.

Micheletti & Burns 2002. *Emerging Issues and Needs in Power Plant Cooling Systems.* National Energy Technology Laboratory (NETL) Conference on Electric Utilities and Water: Emerging Issues and R&D Needs. July 2002. Available at: http://www.netl.doe.gov/publications/proceedings/02/EUW/Micheletti_JMB.PDF. Accessed July 11, 2008.

CANDIDATE COLA REVISION:

No COLA revision is required as a result of this response.

Question 9.3-2

QUESTION:

How would inclusion of information regarding the proposed coal-fired unit 3 at the Limestone site affect the discussion of the site in section 9.3.3.1 of the ER?

Full Text (Supporting Information):

NRG's planned coal-fired Unit 3 at the Limestone site is not mentioned in section 9.3 of the ER. Would the addition of information regarding Unit 3 at the Limestone site affect any of the discussion in section 9.3.3.1 of the ER? Would the discussion result in the same conclusions?

RESPONSE:

The siting of the new coal plant would not change the analysis of the site.

STPNOC anticipated that the ABWR units would be built in the Freestone County portion of the site. STPNOC assumes that the Limestone III plant would take advantage of the infrastructure within the coal-fired plant area in Limestone County. As a result, STPNOC assumed the ABWR units would not significantly affect the construction and operation at the site.

CANDIDATE COLA REVISION:

No COLA revision is required as a result of this response.

Question 9.3-3

QUESTION:

What are the dimensions of the existing transmission line ROWs serving the Limestone site?

Full Text (Supporting Information):

What are the dimensions (length and width) of the existing transmission line rights-of-way serving the Limestone site?

RESPONSE:

The ROWs serving the Limestone site are approximately 150 to 200 feet wide. The existing transmission ROWs from Limestone are approximately 25 miles. An existing ROW runs in a westerly direction to Jewett and is approximately 25 miles to the Jewett Substation. Other ROWs serving Limestone are approximately 35 miles long (Siemens 2007).

REFERENCES:

Siemens 2007. Siemens, *Memorandum to Peter Wybierlala: Preliminary Results of Analyzing Transmission Capabilities for a Nuclear Power Plant in Texas*. May 31, 2007.

CANDIDATE COLA REVISION:

No COLA revision is required as a result of this response.

Question 9.3-4

QUESTION:

Explain how the Malakoff alternative site satisfies NRC's siting criteria for candidate sites.

Full Text (Supporting Information):

The revision to ESRP 9.3 (p. 9.3-2) issued for use by the NRC staff and for public comment calls for candidate sites "to be among the best that can reasonably be found for the siting of a nuclear power plant." Similar language is at p. 9.3-1 of the original version of ESRP 9.3. Section 9.2.1 of Regulatory Guide 4.2 Rev. 2 states that candidate sites must be realistic siting options, potentially licensable, and capable of being developed. The staff learned on their visit to the Malakoff site that (1) water from the Cedar Creek Reservoir is fully committed and would not be available for new nuclear units sited at the Malakoff site, (2) there is some water available in Lake Palestine but the quantity currently available would be insufficient to support wet cooling for two ABWR units, and (3) it is not clear where additional surface water could be obtained for plant cooling, including the Richland-Chambers Reservoir. Explain how the Malakoff site satisfies the ESRP 9.3 and Regulatory Guide 4.2 Rev. 2 siting criteria for candidate sites given these water limitations.

RESPONSE:

During its analysis of each of the alternative sites, including Malakoff, STPNOC assumed that water could be obtained in a number of ways. Primarily, STPNOC assumed that water rights in the nearby reservoirs could be bought from willing sellers. It is likely that STPNOC would seek water rights in the nearest reservoirs, given the potential environmental impacts of pipeline corridors and drilling. However, water rights have not been purchased or developed for the purposes of constructing and operating two ABWR units at the site. It was merely assumed that they would be available, since surface water has been described as "plentiful" in recent Texas Water Development Board Reports.

Using the guidance provided in NUREG-1555 9.3, STPNOC reviewed only the environmental impacts of the ABWR units at the Malakoff site. In doing so, it assumed that sufficient water would be purchased and developed for cooling at the site. In Texas, the availability of water depends on the willingness of a developer to purchase water rights (TNRCC 2002). This is an inherently economic decision; according to NUREG-1555, such economic analyses are left for the "obviously superior" portion of the alternatives review. Because we concluded that the site was not "environmentally preferable" on other grounds (including the *environmental* impact of building water pipelines or drilling wells), STPNOC did not review the economic cost of actually acquiring water rights in nearby reservoirs.

REFERENCES:

TNRCC 2002. Texas Natural Resource Conservation Commission "Rights to Surface Water in Texas," Document No. GI-228. May 2002. Available at http://www.tceq.state.tx.us/comm_exec/forms_pubs/pubs/gi/gi-228.html. Accessed July 11, 2008.

CANDIDATE COLA REVISION:

No COLA revision is required as a result of this response.

Question 9.4-1

QUESTION:

If the MCR is part of the closed-loop cooling system, then describe alternatives considered for the proposed circulating water system including a description of all elements required by ESRP 9.4.2. Describe the process followed to determine that no obviously superior alternatives for the proposed circulating water system, water supply, and water treatment exist.

Full Text (Supporting Information):

Provide an evaluation of locations, designs, and environmental impacts of alternatives to the Reservoir Makeup Pump Facility (RMPF) and to the Main Cooling Reservoir (MCR) blowdown and spillway. Provide an evaluation of the alternative water supplies and alternative water treatments for the circulating water system. Describe the process followed to evaluate the environmental preference of the alternatives. Describe the economic costs of circulating water system alternatives that are preferable to the proposed system.

RESPONSE:

STP ER Section 9.4 discusses the four main elements of the water circulation system (intake systems, discharge systems, water supply, water treatment) as required by ESRP 9.4.2. These elements are discussed below. Cost information is generally not included in this response because no alternatives are identified that are environmentally preferable to the proposed systems.

Intake System

Alternative heat dissipation systems were evaluated in Chapter 10 of the Construction Phase Environmental Report for STP 1 & 2. For each heat dissipation system evaluated, alternatives are described to replenish the water supply. For the preferred heat dissipation alternative (i.e. the MCR), the Construction ER evaluates two possible intake systems, with the existing RMPF as the preferred alternative.

The first alternative water intake system differs from the current RMPF only in size and location of component structures. The alternate screen intake structure would consist of coarse trash racks and 12 sets of traveling water screens recessed 200 feet from the river bank. The intake structure would be about 188 feet long and would rest at an elevation of -20 MSL. Maximum approach velocity to the traveling screens (based a 538,800 gpm flow rate) would be 0.52 feet per second. A sharp-crested weir, 210 feet long, located at the river bank, would function to improve the quality of the intake water. The area between the weir and the screen intake structure would serve as a siltation basin. The pump station would be located immediately

behind the traveling water screens and would have the same design and pump capacity as the existing RMPF system.

The second alternative water intake system described in construction ER considers an offshore intake structure; however, this alternative would have imposed an entirely new concept and operation for the MCR. In addition, an offshore intake structure would dramatically increase the pump and blowdown distance (as compared to the current RMPF), along with associated land use impacts. This alternative was therefore determined not to be environmentally superior to the RMPF.

As for the ER for Units 3 & 4, the RMPF is already built and has been successfully operated for 20 years. In addition, the RMPF was designed and built to accommodate a total of four nuclear power units, and would thus require no design modification to accommodate proposed Units 3 and 4. Therefore, the rationale to build and operate the MCR and RMPF for Units 3 and 4 has already been established in the Construction ER for Units 1 and 2. Thus, the ER for Units 3 and 4 seeks to explore the only viable choices that remain, which are the alternative arrangements of the intakes/discharges/dikes within the MCR.

Four such alternative arrangements are described in ER Section 9.4.2, along with a tabular presentation for ease of comparison (ER Table 9.4-3). Option 1 calls for an intake structure located along the dike that separates the STP 1 & 2 circulation water intake structure and return. Option 2 calls for an intake structure located to the west of the combined STP 1 & 2 and STP 3 & 4 circulation water return flows, intakes and discharges separated by dikes. Option 3 calls for offshore intake positioned directly south of the STP 1 & 2 intake structure, with pipes that span from the intake to run through the dike to a shoreline structure located to the west of the STP 1 & 2 intake. Option 4 calls for an intake structure located immediately adjacent to the STP 1 & 2 intake structure, portion of dike removed to accommodate placement of STP 3 & 4 intake structure between STP 1 & 2 intake and discharge outfall. The process applied to select the preferred alternative is based on a comparison with respect to cooling efficiency, construction cost, and interference with current plant operations. None of the alternatives considered are environmentally preferable to the proposed intake system (Option 1).

Discharge System

Four discharge alternatives are described in the Construction ER for Units 1 & 2. Alternative 1 (the preferred alternative) for units 1 & 2 is also the preferred alternative for Units 3 and 4. This alternative involves discharge to the Lower Colorado River through a multiport diffuser. The second alternative identified for Units 1 & 2 involves discharge to the Gulf through a multiport diffuser. The arrangement would include a pair of pipelines located on the north side of the spillway approach channel that leads to a pair of pumps that discharge into a common pipeline. The pipeline would follow the existing road right-of-way and discharge into the Gulf about 18 miles away. The third alternative for Units 1 & 2 is similar to the second alternative except that discharge would be to the Gulf Intracoastal Waterway. The fourth alternative considered for Units 1 & 2 involves a large diameter pipe with an inlet at MSL elevation 29 feet in the spillway approach channel and an outlet at MSL elevation 18 feet through the spillway chute wall. The

pipe would be designed to discharge through a controlled valve located near the spillway crest to allow controlled releases at a maximum discharge velocity of 2 feet per second. Releases would be controlled as a function of river flow.

Alternatives 2 and 3 would involve longer pipelines and larger disturbed area, and are therefore not environmentally preferred. Alternative 4 would pose unacceptable temperature differentials near the point of discharge. Therefore, alternatives 2 through 4 are determined not to be environmentally preferable to Alternative 1 for proposed Units 3 and 4.

Alternative Water Supply Systems are described in Chapter 10 of the Construction ER for Units 1 and 2. The preferred alternative would replace evaporative and seepage losses from the MCR with water pumped from the Colorado River at the existing water intake structure. Water management guidelines would be applied to ensure withdrawals occur mainly in high river flow conditions. For Units 3 & 4, groundwater wells would provide makeup water to the UHS (two mechanical draft cooling towers) and, indirectly (as blow down from the towers) to the MCR.

Two other options were considered. For the first option, MCR replacement water and MCR blow down could be delivered through pipelines that extend about 18 miles to the Gulf Coast. This alternative would impose larger land disturbance, require additional pump power, and would present engineering difficulties associated with salt content in the water, and is therefore judged not to be environmentally preferable to the proposed water supply alternative. For the second option, water supply could be purchased from reservoirs near Austin. However, this would require construction of a canal or pipeline to bring the water to the MCR, along with the land disturbance and other potentially adverse impacts associated with new construction. This alternative would also represent a future loss of water availability (from the Austin reservoirs). For these reasons, the second option was judged not to be environmentally preferable to the proposed water supply alternative.

Water Treatment

Chapter 10 of the Construction ER for Units 1 and 2 evaluates two main types of water treatment systems. These include (1) the use of chemical agents and (2) the use of mechanical systems. Chemical systems evaluated include chlorination, ozonation, and copper sulfate treatment. Mechanical systems include intermittent scrubbers and continuous scrubbers.

The four basic types of chlorination systems include (1) continuous chlorination to maintain a free chlorine residual (2) continuous chlorination to maintain a combined residual (3) intermittent chlorination to maintain a free residual for a specified period and (4) intermittent chlorination to maintain a combined residual. The first type of chlorination system is the most effective and also the most expensive. The second type of chlorination system is less expensive and less effective than the first, and may be insufficient to control severe fouling problems. The third type of chlorination system is the most widely used and is very effective to control severe fouling. It is also less costly than either of the continuous chlorination systems. The fourth type of chlorination system is the least expensive and the least effective.

Ozone is more effective as a biocide than chlorine; however, ozone has a short life and must therefore be continuously produced and injected. Copper sulfate systems are generally used only for small cooling systems and are almost non-existent in large cooling systems. Copper sulfate systems are effective algaecides; however, these systems must be augmented with other chemicals and stabilizers to control bacteria and fungi.

Intermittent scrubber systems are commercially available for use in condenser tubes to reduce slime formation and accumulation. These systems require that cages be installed to the inlet and outlet ends of each condenser tube, and that a plastic brush be inserted in the tube between the cages. An external arrangement of pipes and water flow control valves is applied to cause the brushes to travel over the length of the tubes.

A proprietary mechanical system is available that uses sponge rubber balls to clean the condenser tubes. The rubber balls have a diameter slightly larger than the inside diameter of the condenser tubes, and these balls are continually recirculated through the tubes to scour the tube walls. Based on operational experience, the continuous scour system has not been proven effective, and may therefore require assistance from a chlorination system in the worst summer conditions. There are two other problems with this type of system. First, the sponge balls can sometimes become stuck in the tubes and thus contribute to local corrosion at the point where they are lodged. Second, if the balls are left in the system too long, the reduction in size (diameter) can allow them to escape into the MCR and potentially cause concern from people who do not know what they are.

The preferred water treatment alternative for Units 1 and 2 is an intermittent chlorination system based on injection of sodium hypochlorite. Selection of this water treatment system is based on a long history of successful use of these systems in the commercial power industry. Based on the successful operation of the water treatments used on Units 1 & 2 (biocide, algaecide, pH adjuster, corrosion inhibitor, scale inhibitor, and silt dispersant), these same treatments would be the preferred water treatment alternative for operation of Units 3 & 4.

An ozonation system would be a highly effective alternative; however, the size and scale of the ozone manufacture plant necessary to treat large water volumes would be prohibitive. A copper sulfate system would not be acceptable because residual concentrations would be toxic to fish. For these reasons, ozonation and copper sulfate systems are not considered environmentally preferable to the preferred alternative.

Mechanical systems represent an environmentally acceptable alternative. However, mechanical scrubber systems have not been proven completely effective to prevent condenser tube fouling, and therefore these systems may also require support of a chlorination system to ensure adequate fouling control in summer conditions. For these reasons, mechanical systems are not considered environmentally preferable to the proposed water treatment alternative (intermittent chlorination).

CANDIDATE COLA REVISION:

No COLA revision is required as a result of this response.